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FOR ALL WORKMEN, PROFESSIONAL AND AMATEUR.

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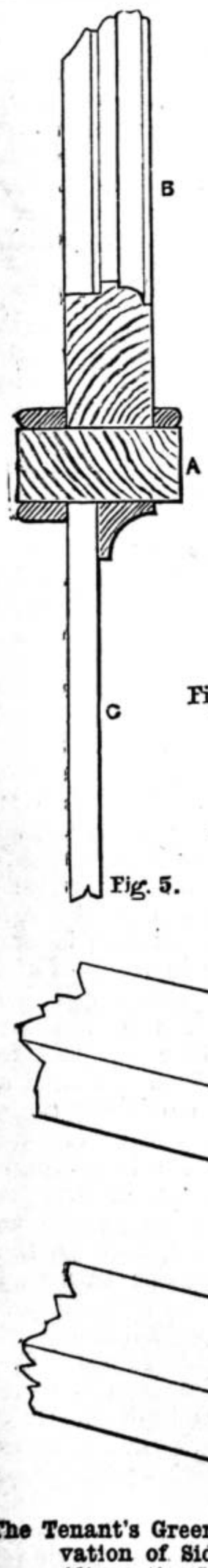

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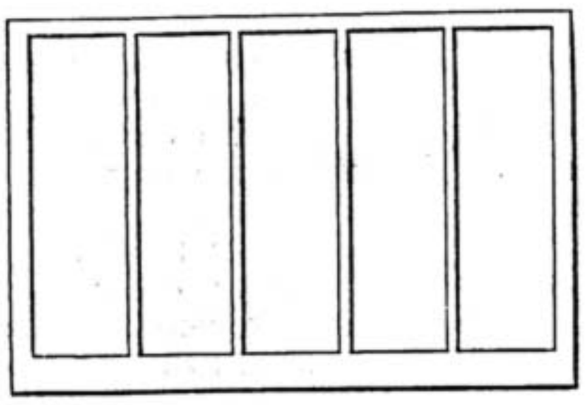

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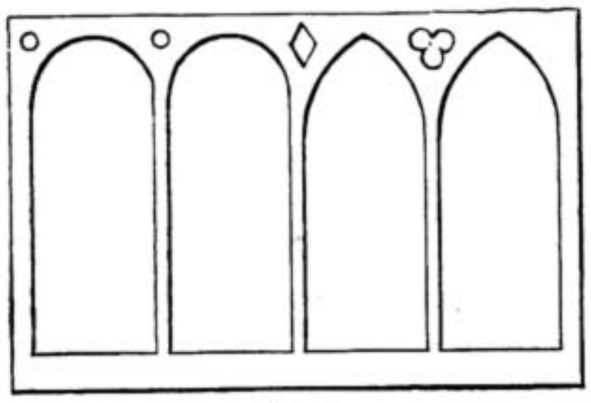

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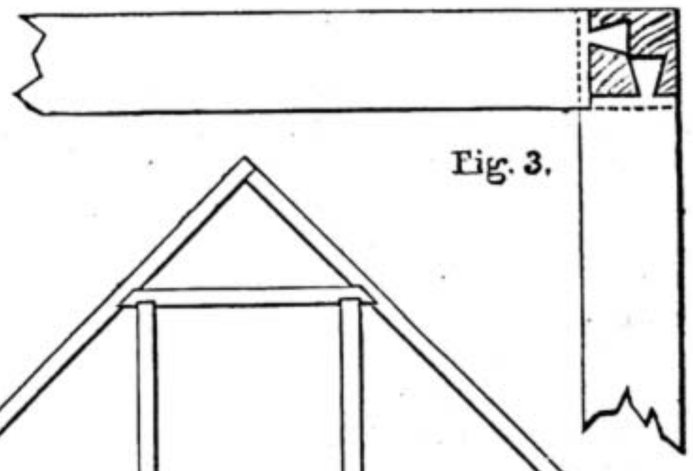

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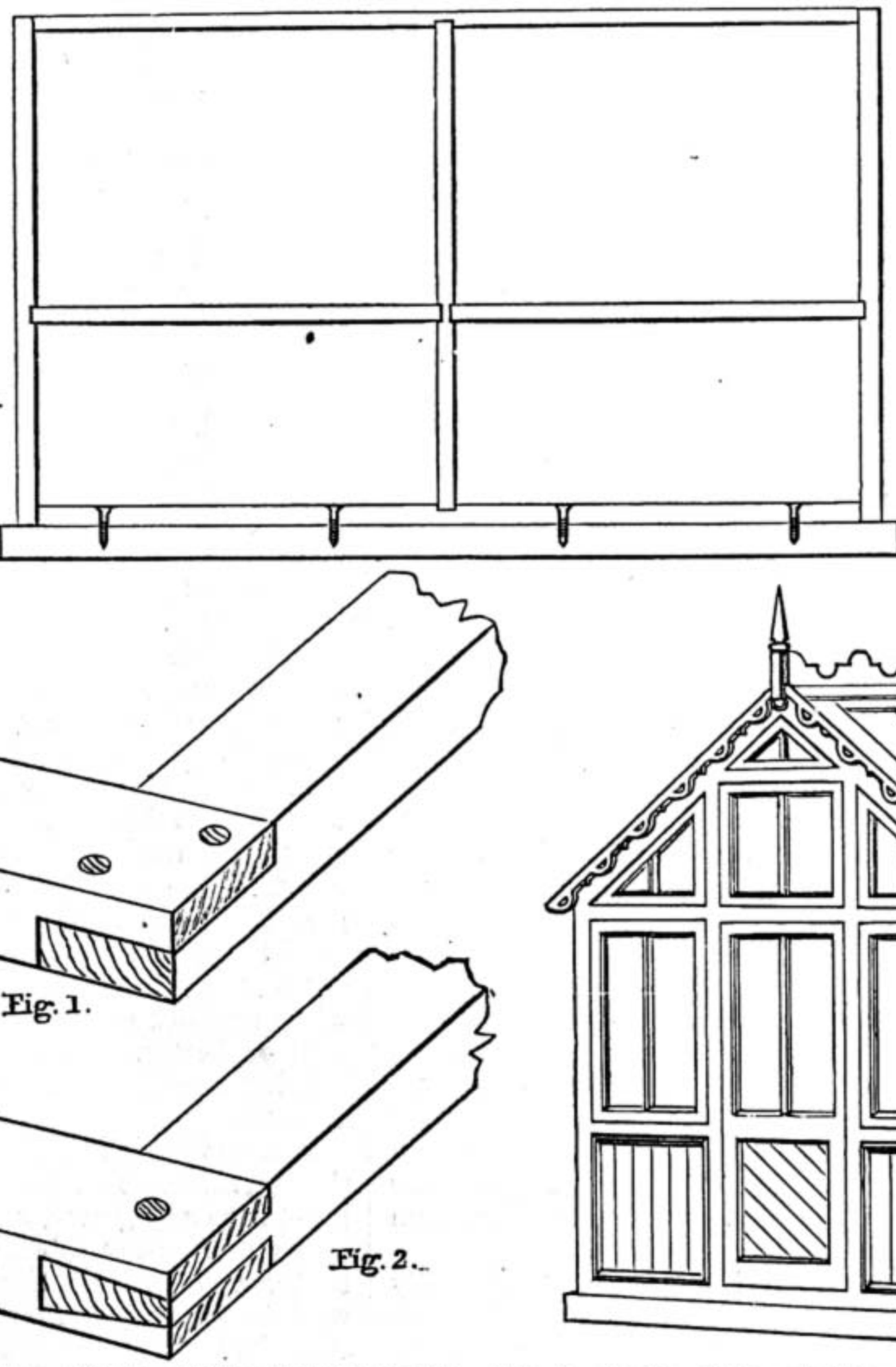

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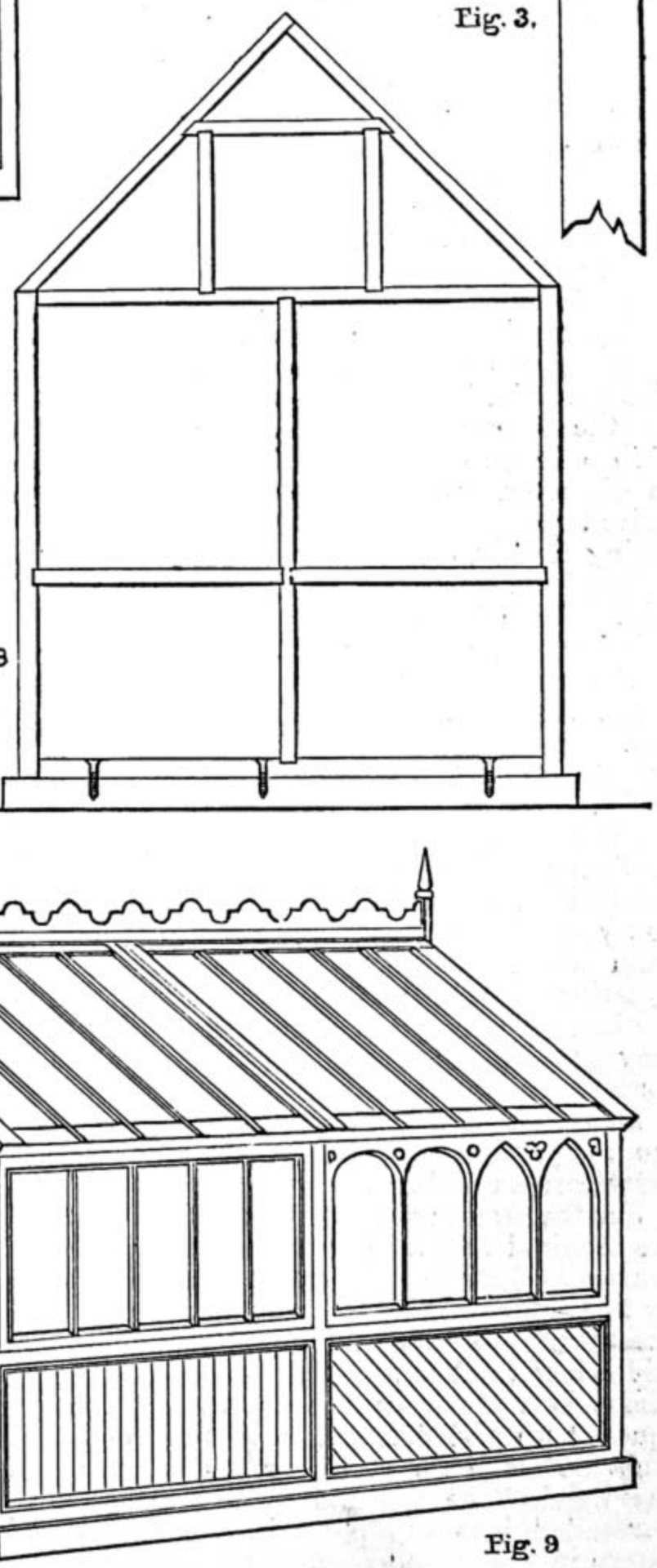

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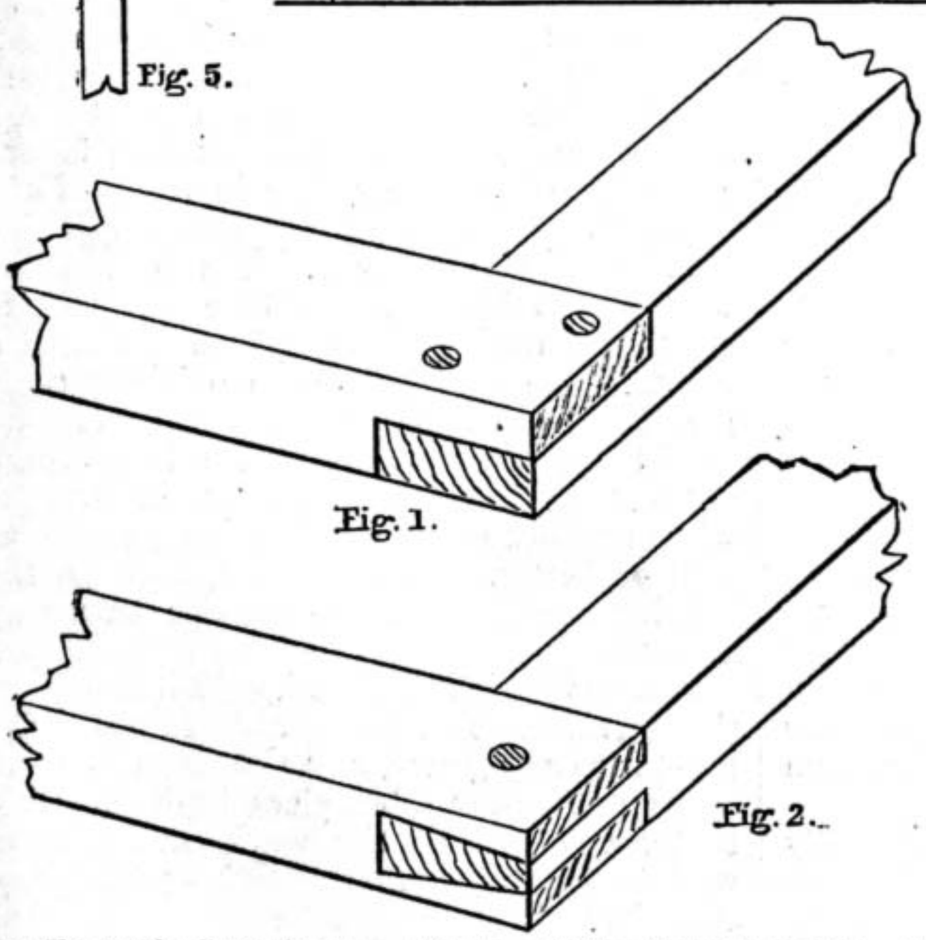

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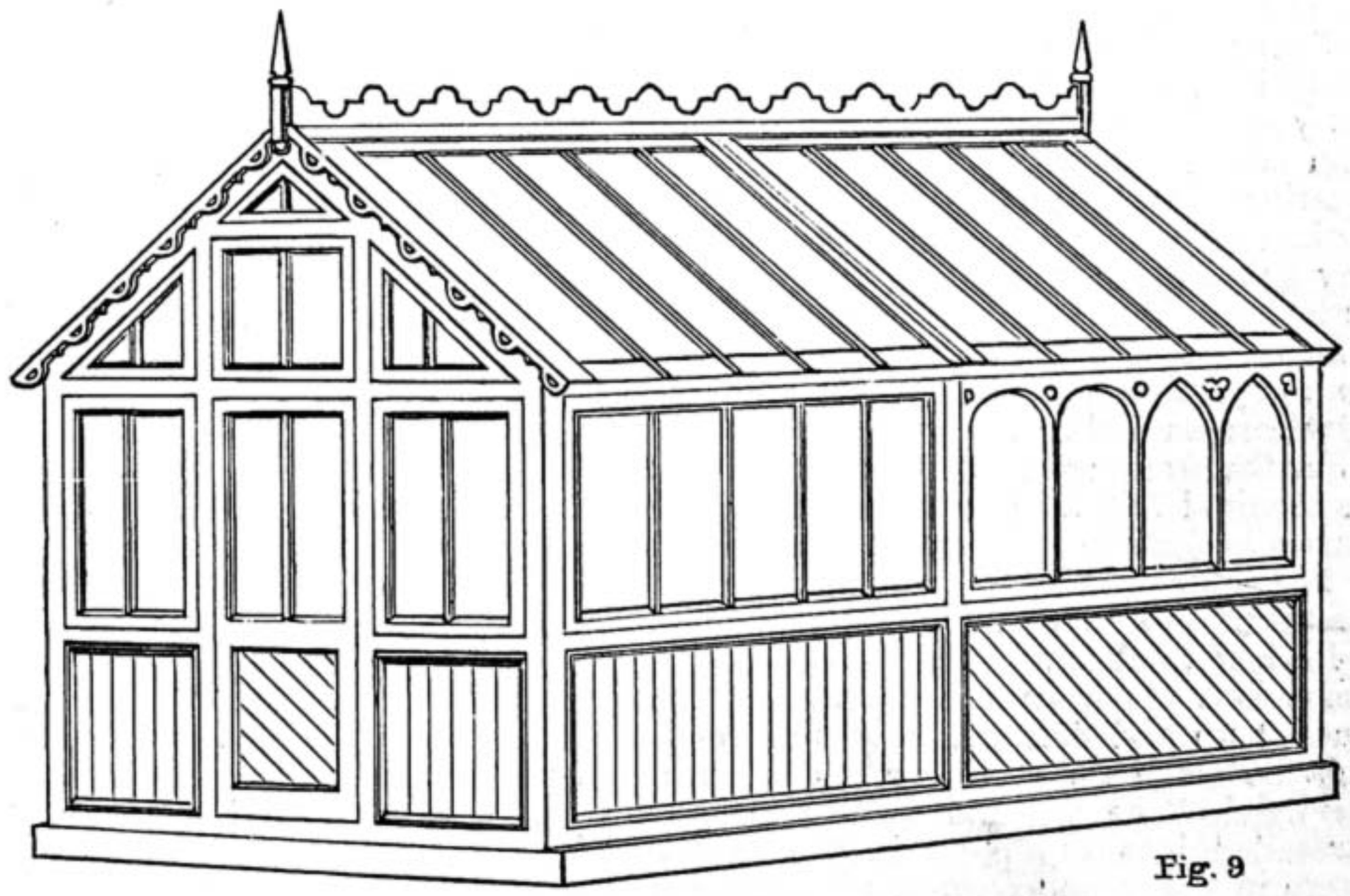

Fig. 9

The Tenant's Greenhouse. Fig. 1.—Mode of Halving Sill. Fig. 2.—Mode of Dovetailing Sill. Fig. 3.—Mode of Joining Rails to Posts. Fig. 4.—Elevation of Side Framing. Fig. 5.—Section of Belt Rail (A), Sash (B), and Matchboarding (C). Fig. 6.—Sash for Upper Part of House. Fig. 7.—Alternative Method of Cutting Sash Heads. Fig. 8.—Elevation of Closed End. Fig. 9.—The Greenhouse Complete.

THE TENANT'S GREENHOUSE.

UNATTACHED TO THE SOIL AND REMOVABLE AT PLEASURE.

BY GEORGE LEBRUN.

PREPARATION OF GROUND — FRAME OR SILL — FRAMING OF HOUSE—BELT RAILS—FILLETS —SASHES IN ALTERNATIVE FORMS — VENTILATOR—END OF HOUSE—APPEARANCE WHEN COMPLETE.

THE possessor of a piece of garden ground, who is fond of cultivating choice flowers, often finds himself wishing for the addition of a greenhouse, in which he may rear those delicate plants that to leave in the open air, exposed to the many changes of our variable climate, would soon kill. Doubtless, many do erect a small conservatory, and find much delight in its possession, while, if the house and garden are their own property, it adds considerably to their value. But there are plenty of less fortunate individuals who simply rent their houses from year to year, or even from month to month; and although the erection in their garden of a small greenhouse might not be very costly, still the knowledge that, upon their removing to other premises, the landlord would step in and claim it as his property, often acts as a deterrent, and so the luxury is foregone, and they have to content themselves with

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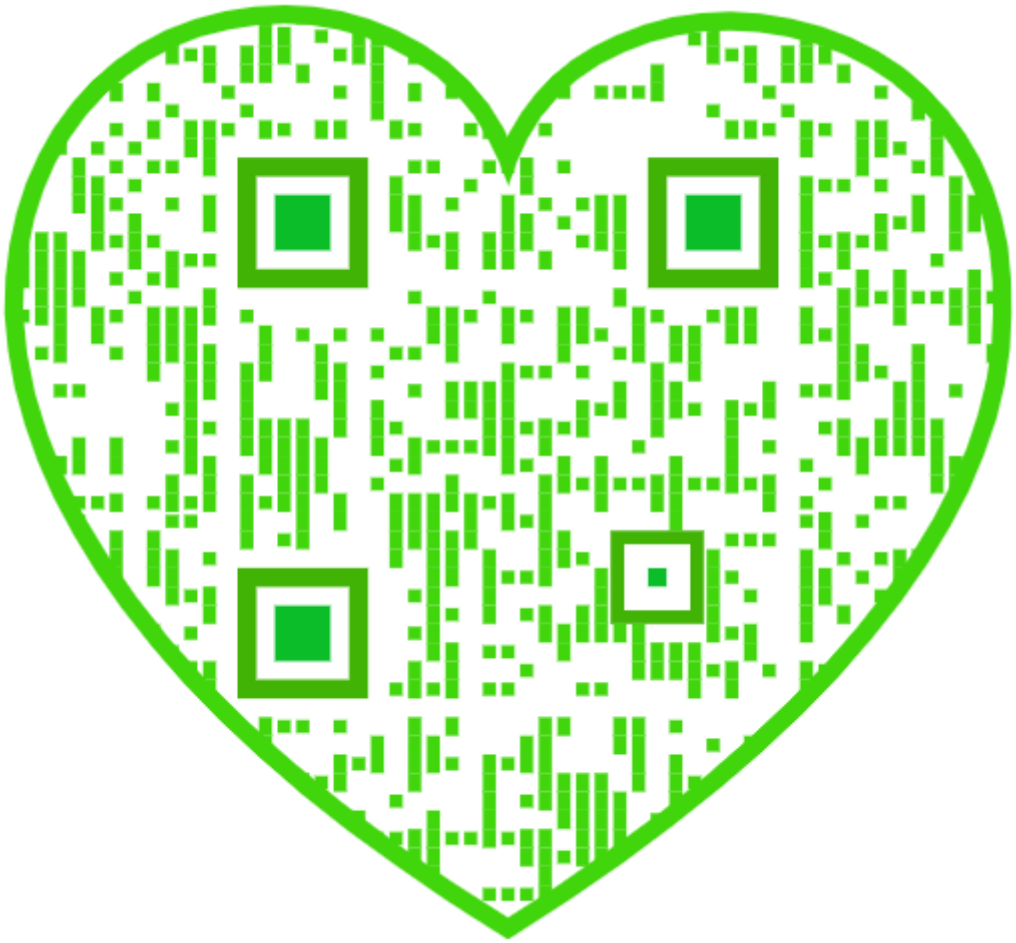

what flowers they can manage to rear in the open air.

Now, without entering into the merits, or the justice, of this right of the landlord to claim all erections put up by the tenant that are fixed *in* the ground, I propose to show how a greenhouse may be built *on* the ground, and so, in a legal sense, may be removed in the same way that a barrel or box could be taken away if only left lying in the garden; that is, I mean to say that it will simply lie on the ground in the same manner as the barrel or box, and be in no way fixed to it. Further, as the several pieces and sections of the building will be held together by means of screws, it may, I think, with every right be considered a "tenant's fixture," and be taken down, removed, and re-erected in the new garden.

The particular greenhouse for which the design, details, and sizes are given, will be 12 ft. by 8 ft.; this is a very suitable size for a small garden, and does not cost much for material, while those whose requirements or aspirations demand a larger size can easily increase the dimensions, the manner of construction remaining the same.

Firstly, then, the ground on which the house is to be put up must be laid off and nicely levelled; then four 7-in. by 5-in. battens, two of which are 12 ft. 3 in. and two 8 ft. 3 in. in length, are taken and joined at the four corners by halving them into each other, as in Fig. 1. Two holes, 1 in. in diameter, are bored down through the halved parts at each corner, and oak pins, fitting tightly, driven through them.

You have now a frame 12 ft. 3 in. by 8 ft. 3 in. There is no need to plane up any of this framing, but, after cutting off the ends of the oak pins that project from the corner holes, it should receive a good coating of coal tar. This frame forms the sill or foundation of the house, the upper part of which rests upon and is fixed to it. The frame I have described can now be put in its final position *on* the ground previously levelled up, care being taken to get it perfectly square by measuring diagonally across from corner to corner, after the manner of squaring a sash. There is an alternative method of joining the ends of the sill that may be adopted; it is shown at Fig. 2; the corners are dovetailed, and a single pin driven through to prevent slipping. This mode of joining is the best, but entails some extra care and labour.

For the framing of the house four posts are required 7 ft. long by 4 in. square; also four rails for the sides 11 ft. 8 in. by 4 in. by 2 in., four rails for the ends 7 ft. 8 in., and five upright pieces 6 ft. 9 in., all of the same width and thickness as the side rails. The dimensions given are the *exact* sizes when squared up and finished, so that allowance must be made for cutting when procuring the wood. The top and bottom rails are dovetailed into the posts in the manner shown in Fig. 3, and secured with two long screws in each end. One upright piece is put in the centre of each side, one in the centre of the closed end, and two in the front end, 2 ft. apart, to serve as door frames. The upright pieces are cheeked ½ in. into the top and bottom rails, and are also secured by screws put in on the angle. Fig. 4 is an elevation of the framing of one side, showing the manner of attaching it to the sill by means of 5-in. wood screw bolts, the heads of which must be sunk flush with the surface of the wood. Pieces of the same scantling as the rails are now put in at a height of three feet from the upper side of the sill; they are halved and screwed in the same manner as the uprights, and, for the sake of clearness, I will term these pieces the "belt rails" when I have occasion to speak of them in the course of my description.

Fillets 1 in. wide and ⅝ in. thick are now put round all the openings on the inner side. These fillets should have a bead run on the edge, and be mitred at the corners, so as to form a better finish to the inside of the house than if they were left plain; these fillets may be put on with ordinary nails. ⅝ in. matchboarding is now cut into lengths to fit between the bottom and belt rails, and put in its place *without nailing*, and a moulding, mitred to fit the opening, put round the outside, and fastened in with screws; this keeps the matchboarding firmly in its place and allows of easy removal. Narrow matchboarding (about 3 in.) should be used, and, if thought necessary, two bars can be nailed along the inside at top and bottom so that the whole of the pieces come out like panels. The boarding can either be put in upright or diagonally, the latter having the nicest appearance. Fig. 5 shows the various details in section.

The upper openings are filled in with sashes, made to fit, and secured as shown in Fig. 5. The stiles and lintels are of 2½-in. by 2-in. stuff, the soles 3½ in. by 2 in., and the sash bars 1 in. by 2 in. These sashes can either be made square as in Fig. 6, or, if a little extra labour is of no moment, may be made of an ornamental character by putting in a deep lintel and cutting out either circular or Gothic tops, in which case the moulding and glass cheek will require to be worked by hand; this and the sawing out is best done after the sash is glued and cramped together. (Fig. 7.) The piece of dead wood between the panes can be lightened by cutting a trefoil or other ornament out of ⅜-in. wood, and putting it on the top rail between the openings. The closed end of the house is filled in in exactly the same manner as the sides, and the upper part for the support of the roof is framed up by two pieces of 4-in. by 2-in. wood, dovetailed together at the apex, and let into the tops of the corner posts at their lower ends. A square opening is formed with 4-in. by 2-in. stuff, in which an opening sash is hung on pivots, and the triangular openings at the top and sides are filled in with sashes made to fit them. The construction of the end is shown in detail at Fig. 8, which is an elevation of the end framing.

In Fig. 9 a perspective view of the greenhouse, when completed, is shown with alternative methods of making the sashes. I shall allude to this illustration in a future paper, in which I shall speak of it more fully. I give it here, however, as most of those who wish to erect such a structure will wish to see what it will look like, even before commencing operations.

I have described a house technically known as a "span roof" house, partly because a correspondent has asked for instructions for erecting such a structure, and partly because it is better fitted for the requirements of a tenant than a "lean-to" greenhouse, which in ninety-nine cases out of a hundred is reared against the wall of another building, and has not in reality a back of its own. Should any one, however, wish to put up such a greenhouse on his own premises he has simply to nail a wall-plate to the wall to take the upper ends of the rafters and sash bars, and provide for ventilation by a lifting light in the roof. If he wishes to put up a removable "lean-to" on another's premises he must put a back to it.

(*To be continued.*)

ON CUTTING REBATES.

BY DAVID DENNING.

If the question, what kind of plane should be used to form rebates or rabbets with? were asked of two men, both workers in wood, but one of them a carpenter and the other a cabinet maker, the answers would probably differ. The carpenter would probably say a fillister, the cabinet maker a rabbet plane; perhaps going a step further, each would say the other was making a mistake. The inference which might naturally occur to the mind of the non-technical from such different opinions would be that either tool might be used, or that neither of the men knew what he was talking about. Parodoxical as it may seem, both these inferences are correct, for either the rabbet plane or the fillister may be used in making any ordinary rebate, and the man stating that one or other tool should be used exclusively, could certainly know very little of the work to be done by the other.

How then does it happen, it may be fairly and properly asked, that two men, both presumably skilful in their own departments of joinery, one the cabinet making and the other the building, use different tools to effect the same result? The answer is simply because each finds the tool he advocates is the best for his own purposes. Ask a cabinet maker why he prefers a rabbet plane, and he will at once say that it is better for the comparatively small work he is generally employed in making. It is to the fillister what the smoothing is to the jack plane. Even the joiner will at once acknowledge that if a finely-finished rebate is wanted, the rabbet plane may be used with advantage, but only after the fillister has done its share of the work. The cabinet maker, on the other hand, will object to using the fillister at all, unless, indeed, on exceptional pieces of work or from personal idiosyncrasy. He will state that any advantages which may exist in the fillister are rendered useless from the amount of labour required to force the cutter in front of the iron through hard wood—a piece of Spanish mahogany, for example. He is not far wrong, for though it would be incorrect to say that a rabbet could not be cut with a fillister—the side fillister in ordinary cases preferably—in hard wood no sensible man would voluntarily choose the tool which induces the greatest amount of fatigue when another would answer his purpose as well or better. In soft wood, such as the builder mostly uses, the fillister cuts well enough.

But, says this individual, only just look at the convenience of being able to "set" the fillister to any gauge, and the fence to serve as a guide; the rabbet plane is destitute of these, and with it the work cannot be so well done. What is there to keep the plane straight?

Well, skill assuredly counts for a good deal. If a man has been in the habit of working without a fence, he does not feel the need of it so much as another who has been trained to depend on it. Of course, a line to work must be marked in some way, with an ordinary gauge, for instance, or, where extreme accuracy is not required, by drawing with a pencil. Careful manipulation does the rest. As for the actual details, such as the mode of holding the plane and the use of accessory tools, they vary. One man will use the plough to form a groove to the required depth, another will be content with cutting gauge and

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chisel to remove a little of the waste wood before taking up the rabbet plane, while a third will simply rely on his fingers. Each, if he be intolerant of other ideas than his own, will claim his own method as the best, and doubtless it will be for him; but if he be a man of liberal mind he will at once say that there is no absolute best, and that it altogether depends on the custom of the worker.

It is rarely indeed that a good practical artisan, who has arrived at the years of discretion, has not found out which is the most convenient way for himself personally to use the ordinary tools of his craft. He may go to the length of telling youngsters who ask him which way he finds best, or even in friendly chat will discuss with others equally as competent as himself the pros and cons of various methods, but as for saying that every other but his own must be wrong—well, to do so would not reflect credit on his intelligence, but it might, and very likely would, be very strong presumptive evidence that his work would be that of a "duffer." Not that even such workers are not useful sometimes, so if any of them read these lines, and feel inclined to take umbrage, perhaps they will kindly remember that the word is used in a Pickwickian sense, and that they are frequently to be thoroughly relied on for doing whatever they have been accustomed to do—turning the grindstone, for instance, to the entire satisfaction of all concerned.

But, it may be inquired, do no workers fall into bad habits in their methods? do they invariably choose the best for their particular purpose? To answer this fully it would be necessary to consider many points in detail; but without by any means suggesting that absolute perfection exists in any workshop, professional or amateur, it may safely be conceded that most mechanics have a very fair idea of what suits them best. The cabinet maker and the carpenter can therefore very well agree to differ on cutting rabbets and the proper tools to use, remembering that to find fault with each other simply shows imperfect knowledge of the requirements of both trades, however competent one may be to express an opinion about his own. "Eh, mon, it's a graat peety that we canna a' think alike; but ah'll no change ma ain opeenion for that o' ony ither body." "Ma ain opeenion" is that it is at any rate rash to condemn other methods or tools if we do not know the reasons for them being used; and that occasionally, very occasionally, the least little bit of toleration of other people's mode of working might be better than none at all, or wholesale condemnation.

BURGLAR ALARUMS:

How to Make, Work, and Maintain.

BY GEORGE EDWINSON BONNEY.

INTRODUCTION — ELECTRIC ALARUMS — HOW TO CHOOSE AN ELECTRIC BELL—HOW TO MAKE THE ELECTRIC BELL—THE WOOD BASE—THE METAL FRAME—THE MAGNETS—THE CORES OF THE MAGNET.

How truly delightful it would be if all honest people could dwell together secure from alarm from burglars, in an Arcadia where bolts and bars and locks were not needed, because "thieves do not break in and steal!" Such a state of security cannot be attained in "happy England" by persons holding portable property, for thieves are ever on the alert to enter an unlocked and unlatched door or climb through an open window to relieve the honest householder of his worldly goods. Because of this failure on the part of dishonest neighbours to recognise the law of *meum et tuum*, the honest man is compelled to live in an atmosphere of suspicion, and secure his property under the safeguard of locks and bolts in safes and strong rooms. Those of my readers who have read the "Real Detective Stories," by William Henderson, in CASSELL'S SATURDAY JOURNAL, must know how the thieving fraternity make light work of locks and window fastenings when they have decided to "crack a crib," *i.e.*, break into a house. Locks that cannot be easily picked fail to securely fasten doors when these are under the persuasive influence of the burglar's boxwood and steel wedges, and window fastenings spring back readily as they feel the thin blade of the thief's knife. Not a winter passes over our heads without leaving a long newspaper record of the doings of Bill Sikes and his "pals" in town and country wherever their fancy may lead them. A hand-to-hand encounter with an alert burglar, wide-awake and armed with a steel jemmy, whilst you are just newly aroused and can only defend yourself with the pillow, is not at all a pleasant surprise in the middle of the night. A loaded revolver under the pillow has been suggested as a remedy, but the remedy seems to me to be only one remove from the disease, for burglars now arm themselves with revolvers, and it is the man who gets the first shot who is likely to win at the game of bedroom duels. Revolvers are also dangerous tools to have about a house, or, indeed, anywhere else, for they have an unpleasant knack of going off just when you least expect them to do so, and at such times some friend is sure to get in the way of the bullet.

We want to be apprised of the thief's intentions before he walks, unannounced, into our bedrooms, and we want to receive warning of his operations before he has cleared out all the valuables in the lower rooms. Dogs have been tried, but a dog, however faithful, may not be proof against the bribe of a poisoned bait. Many amusing tales have been told of amateur burglar alarums and their failures; of tea-trays and fire-irons clashing together whilst puss, in her zeal, pounced on the thievish mouse; of torrents of shot making an unearthly din in a milk-pail in the dead watches of the night, because the plug of the pouch had been set too loose: and sundry other futile attempts to set automatic sentinels.

All such failures should now be relegated to the dark ages before the invention of electric bells: there is not any excuse in the present day, on the part of well-to-do householders, for leaving their premises unguarded. For a few shillings, not exceeding one per cent. of the value of the property to be protected, a thorough system of electric alarums may be set up in any house, and these generally scare the thieves away ere they can effect an entrance, whilst they arouse the soundest sleepers to take part in the defence. Electric alarums, properly fixed, are also so certain in their action that they do not give false alarms, nor do they fail to give an alarm should a thief *attempt* to open a door or window guarded by them. They also serve a useful purpose in detecting an open door or unfastened window when all should be closed at night, and it goes without saying that they also prevent the lambs of the house straying from the fold when all the inmates should be wrapped in sleep.

Such a system I hope to fully describe and illustrate in this first paper of the series and succeeding articles.

Electric Alarums.—Electric alarum systems have one feature in common. An electric bell of the continuous ringing type is placed in communication with springs, so inserted in the doors or windows to be guarded as to be kept from ringing the bell when all is secure, but to spring into instant action when an attempt is made to open a door or window. The first necessary article is, therefore, a bell of the right type, and this may be bought at prices varying from 4s. up to 25s., according to quality and size, or it may be made by any man accustomed to the use of tools in metal working. Electric bells vary very much in quality and type. A badly-made bell is dear at any price, for any purpose, but is specially objectionable when set as a sentinel. If badly-wound magnets are employed, and leaky connections are made, it will ruin the best of batteries, and failure will be put down to an exhausted battery. If hard or badly-annealed iron is used in the magnets, the armature will stick close to them on the first contact, and fail to ring the bell. If badly-fitted screws are employed, or badly-constructed contacts are used, or the metal parts improperly fixed to the wooden base, the bell may cease to act just when most required, and effectiveness is sacrificed to false economy. Even as the ship was lost for lack of the proverbial "ha'porth" of tar, and for want of a nail the horse was lost, so a house may be lost for want of a proper bell.

How to Choose an Electric Bell.—As so much importance attaches to the bell, I will here show the good and bad points of electric bells as a guide to their choice. If a bell mounted on a metal frame with a wood base is chosen (and some of the best bells are so made), see that it is made of teak or mahogany, or some such wood not easily warped by changes in the moisture and temperature of the air. If the base is of iron or brass, or the bell is of the Jensen pattern, see that the contact pillar is well insulated from the metal work with collars of ebonite above and below, and that the connecting screws are similarly insulated. See that the set screw has good threads, is well fitted, and is provided with a good lock-nut. If this part is defective, the armature spring will work out of contact under the jarring action to which it is subjected. Have the bell set a-ringing, and then try to stop it by placing the forefinger lightly on the armature; if this sticks to the magnet in any way, and does not readily recover itself, reject the bell, for the iron of the magnet is, doubtless, unannealed. A good electric bell magnet should attract iron filings when the current is passing through its coils, but should drop them the instant the current is interrupted. The set screw should be tipped with platinum, and this tip should be in contact with a speck of platinum soldered or riveted to the armature spring. Get the vendor to guarantee these parts to be of platinum, as German silver or aluminium is sometimes fraudulently substituted. A drop of nitric acid from the tip of a glass rod will turn German silver green, and a drop of hydrochloric acid, applied in the same way, will dissolve aluminium, whilst these acids, separately, have no effect on platinum.

Specially made bells for alarums, fitted with automatic relays, are now sold by respectable dealers in most large towns. If these cannot be obtained, the next best will be a good 3-in. bell of the vibrating or trembling type. Single stroke bells are

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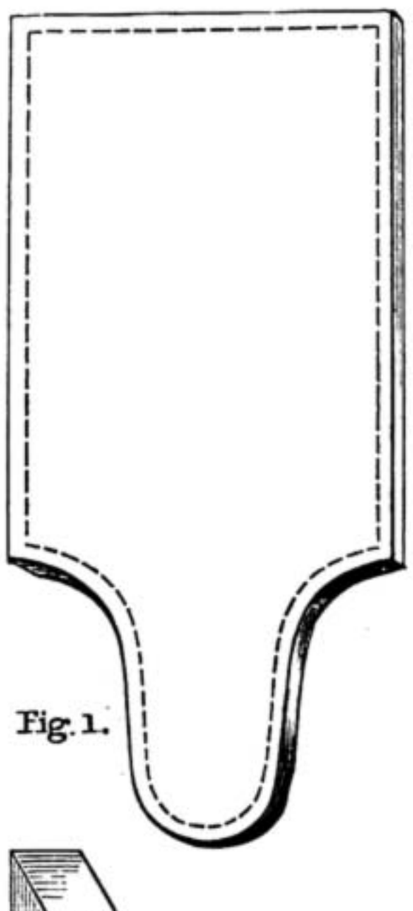
useless for this purpose. A fairly good 3-in. bell costs 10s. 6d., and the same with automatic relay from 17s. to 18s.

How to Make the Electric Bell.—I have received so many grateful testimonials from working men who have made electric bells from my instructions, that I begin to think almost any man can make such a bell if he has the means at his command to get the tools and materials. It should be understood, however, that there are grades of makers as well as grades of bells. The man who buys materials and sets men to work for him in making bells claims to be a maker of electric bells, although he may not know how to put the parts together. Another man buys the various parts, and, putting them together, says he has made an electric bell. Who will dispute his claim? The various parts were not an entire bell until he put them together. It is to such a would-be maker of electric bells I now write. To each and to all I would say, make as many parts of the bell out of the raw material as you can; only a stickler for originality will go to the extent of exacting such a strict adherence to the letter as to require a maker to cut his own wood, cast his own metal, draw the wire, and cover it with silk spun by himself. Very few, if any, makers of electric bells draw the wire and cover it, or cast the gongs, as this is better and more cheaply done by persons who make it their business.

The Wood Base.—The first requisite for an electric burglar alarm bell is a piece of wood for the base. If the base is for a plain 3-in. bell, select a piece of sound well-seasoned teak or mahogany 8 in. by 4¼ in. by ⅞ in. If the base has to carry a relay in addition to the bell, the wood should be two inches longer. Plane both sides smooth, then cut the planed wood to the form shown in Fig. 1, and bevel the edges on the face of the base. Fill in the grain of the face and edges, and French polish them in the usual manner.

The Metal Frame.—The next requisite is a metal frame to hold the magnet, armature, contact post, and bell pillar. This may be of sheet iron, sheet brass, sheet copper, or even stout sheet tin cut to the form shown in Fig. 2. Or it may be cast in this form in brass, gun metal, or iron. The dimensions are, from A to B 5¼ in., from C to D 3 in. As the main use of this frame is to hold all the parts together, and not allow them to be shifted in their relative positions to each other by changes of temperature and jarring motion in the bell itself, the frame may have other forms and be equally useful. Some of these are shown at Figs. 2, 3, 4, and 5. The reference letters in each figure correspond with each other. B shows the hole for the foot and tang of the bell pillar; P, the hole for the foot and tang of set and contact screw pillar; S, the lug or turned-up angle to which the armature spring is fastened; and M, the position of the magnets. The position of the magnet bobbins is shown in Figs. 4 and 5 by dotted lines. The yokes of the magnet cores are, in these forms, made separate from the base plate, and fixed to it afterwards by studs or set screws.



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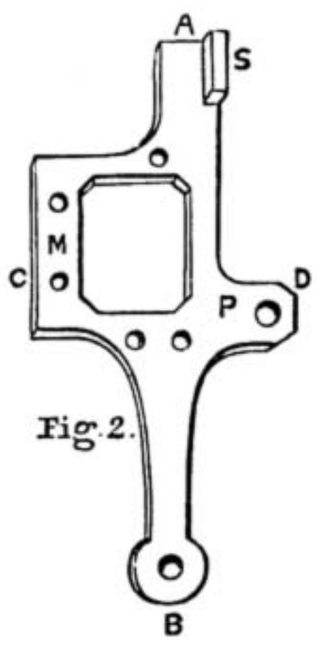

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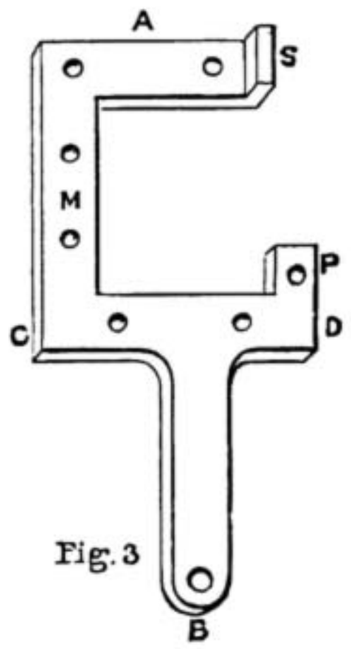

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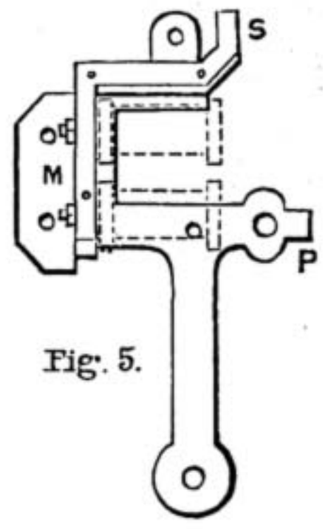

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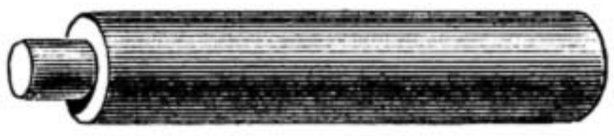

Fig. 6.

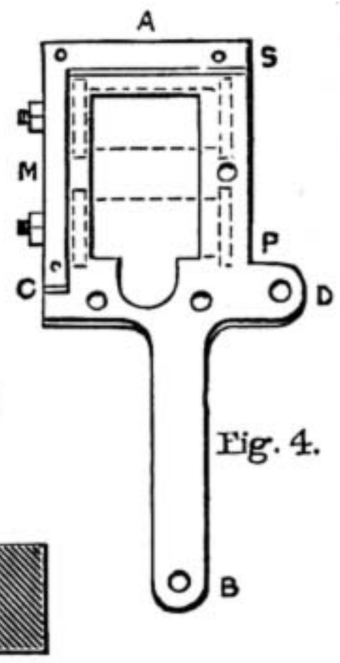

Fig. 4.

Fig. 7.

Fig. 8.

Fig. 9.

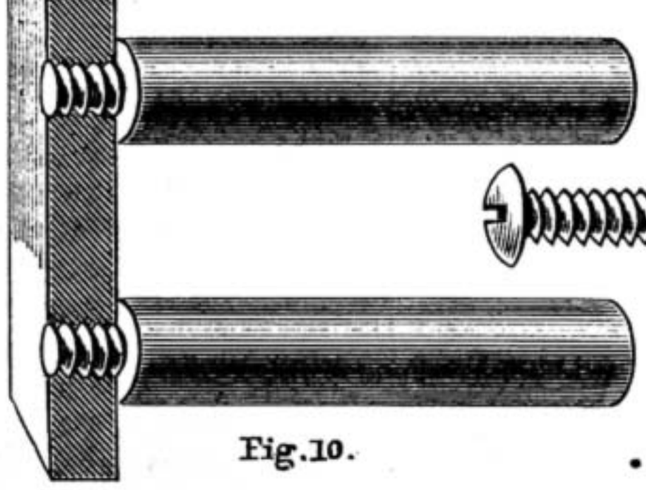

Fig. 10.

Fig. 1.—Form of Wood Base for Electric Bell. Figs. 2, 3, 4, 5.—Some Forms of Metal Bases for Electric Bells. Fig. 6.—Core of Magnet with End turned for rivetting to Yoke. Fig. 7.—Core of Magnet with End bored and tapped. Fig. 8.—Section of same, showing Screw Stud. Fig. 9.—Core of Magnet with End turned and screwed to receive a Nut. Fig. 10.—Magnet Cores turned and screwed into Yoke.

relative sizes of these parts for several different sizes of bells:—

PROPORTIONATE PARTS OF MAGNETS.

Diameter of Bell.	Length of Magnet Cores.	Diameter of Magnet Cores.	Length of Bobbin.	Diameter of Bobbin Head.	B. W. G. of Wire on Bobbin.
Inches.	Inches.	Inches.	Inches.	Inches.	
2½	2	1 5/8	1¾	¾	24
3	2¼	1 11/16	2	⅞	24
3½	2½	1 ¾	2¼	1	22
4	2¾	1 13/16	2½	1¼	22
5	3¼	1 15/16	3	1⅜	18
6	3¾	2 1/16	3½	1½	16
7	4¼	2 3/16	4	1⅝	16
8	4¾	1	4½	2 1/16	14
9	5¼	1⅛	5	2⅜	14

The Cores of the Magnet.—The cores must be made of good tough iron rod (Swedish iron is recommended). The length given in the above table allows for the ends being turned down and screwed to receive the nuts which hold them in the yoke. Some makers dispense with nuts, and secure the cores to the yoke with screwed studs entering the cores. If this plan is adopted the ends of the cores must be drilled and tapped to receive the studs, and it will not be necessary to cut the pieces of iron so long as when they are to be fastened by nuts. However tough and good the iron may be, it must be annealed to make it quite soft after the cores have been cut off. If the cores are made of hard iron, or are imperfectly annealed, they will retain some magnetic influence over the armature after contact is broken. Iron cores are annealed by heating them to a blood-red tint in a good fire, covering fire and cores with hot ashes and allowing all to cool down gradually for some ten or twelve hours before disturbing the iron.

After they are annealed, the back end of each must be turned down to form a tang with shoulder to fit in the yoke, and the front ends filed level and smooth to form faces for the armature. If the iron rod is quite round and smooth the cores need not be turned, but the roundness and smoothness should be seen to, so that the cores may fit the bobbins of the coils, for it is most important that the wood of the bobbins should lie close to the cores.

If the cores are to be riveted to the yoke, this must next be done. If they are to be attached by nuts, the tangs must be screwed and the nuts tapped to fit them. If they are to be fastened by screws or studs, the holes must be drilled and tapped to receive the studs. At any rate, all this must be done before the bobbins are made, and wound with wire. In Figs. 6, 7, 8, 9, 10, I show several ways of attaching the cores to the yoke, but I consider the neatest and best to be either Fig. 7 or Fig. 10.

Before bringing this paper to a close, I may remind the readers of WORK that prevention is better than cure, and that it is better to frustrate Mr. William Sikes's amiable intentions towards your belongings and yourself, if need be, by fitting a house with alarums that cannot fail to herald his approach and declare his presence, than to have to calm down scares, or, perhaps, plug bullet holes in body or limbs. Moreover, prevention is the cure itself, for if burglars could be treated wherever they went to an experience of this, the veritable "burglar's horror," they would be compelled in self-defence to betake themselves to honest ways.

(*To be continued.*)

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SOME LESSONS FROM AN OLD BUREAU.

BY DAVID ADAMSON.

(*Continued from page* 116.)

II.—INSIDES OF DRAWERS—CUTTING OUT—GLUING AND DOWELLING—AFTER JOINTING UP—HINTS ON DOVETAILING—FITTING DRAWERS—INNER TOP AND RAILS—ANTIQUE FURNITURE—FACING SLIPS.

AT the end of the preceding paper I made mention of the "insides" of the lower drawers. If I were writing for professional workmen only, I need not say anything as to what is implied by this term. I must not forget, however, that I am writing for amateur workmen as well, and as some of them may not understand what is meant by "insides" of drawers, I may explain that the sides (or ends), back, and bottom of a drawer are often thus designated. Thus, in speaking of a chest of drawers—which is very much akin to the bureau—it is perfectly well understood when it is said to have "pine insides" or "mahogany insides," that the drawers themselves are made of the wood specified. Where pine is not considered good enough, ash insides are commonly used with oak, and mahogany with walnut or mahogany work. There is no hard-and-fast rule on the matter; but by accepting and adopting trade customs—where they are not prejudicial to durability—the amateur artisan may to a great extent avoid the "amateurish" character which so frequently betrays itself to the experienced eye. His work may be equally serviceable, but, as a general matter, it is not well for him to depart from the methods which are found the best by practical workers, unless he has some good reason to do so. This is far from saying that improvements are not to be made, nor recognised when made, either in tools or methods; but as a rule, if there is anything good in them, they are the outcome of study and thought, prompted by such experience as the amateur can hardly expect to have. These remarks may seem hard on amateurs and beginners, but I trust those who may be inclined to resent them will consider they are given in a friendly spirit by way of enabling those who wish to do so to turn out work in the best possible style.

But with regard to the "insides:" if pine is to be discarded for these parts, it is only necessary to read Nos. 32 to 36, both inclusive, as being of the wood preferred to it. By the way, referring to mahogany for these parts—and I may say that, personally, I like this wood even with oak—it is not to be supposed that choice wood is necessary. Cheap baywood is quite good enough; but the reminder that mahogany insides are often made of *cedar* may be of service. The cedar used for such purposes is the kind of which cigar boxes are made, and must not be confounded with what is commonly called pencil cedar. It is easily worked, and is a most suitable material for "mahogany" insides. Perhaps the mention of pencil cedar may suggest to the would-be maker of the bureau that the small drawer insides might be made of it. It is a nice delicate wood for the purpose; but the fact must not be overlooked that the oil contained in it, and on which its fragrance depends, is sometimes apt to discolour notepaper, etc., left long in drawers made from it. Moth, however, object to cedar (pencil), so that there are advantages attaching to its use, and any materials subject to the attacks of these little destroyers placed in cedar may be regarded as secure from their ravages. When the wood is finally decided on for the various parts, the bureau may be proceeded with.

The first thing is to cut them out to the sizes ascertained from the working drawing and list. It is hardly likely that the stuff will be wide enough in the plank to allow of such parts as the ends and large drawer bottoms being got in single pieces, and they must be jointed up. Do this, to get the necessary width, before smoothing the stuff—that is to say, while it is still rough. Thin parts, such as drawer bottoms, will merely require gluing together, but the ends should be dowelled as well. It can hardly be necessary to explain the operation of dowelling, as it is presumed that, before attempting to make a piece of furniture such as this bureau, the rudiments of joinery will have been mastered; but as it is just possible some may be stuck by not knowing what dowelling means, the hindrance may be removed by referring them to an ordinary extending dining-table. If they will open this out and look, they will find that on the inner end of one of the halves there are a few round pegs, which, when the table is closed up, fit into corresponding holes in the other half. These pegs are dowels to all intents and purposes, but they are only glued at one end. Put similar pegs, glued all over, between two boards, also with their edges glued, and we have what is known as the "dowel joint," a full description of which has already been given. Gluing the boards together might do, but dowelling, when properly done, makes the joint stronger. Another part that may require jointing up, in order to get the necessary width, is No. 3—the table-top. If the part under the pigeon-holes is pine (which is suggested merely to save cost of material), a join will certainly be necessary, and it will be well to see that it is so made that it will be out of sight—viz., a little back under the superstructure. In connection with the top, another small economy may be practised without detriment to the work, though it is almost a "bull" to say this, as, if the work were to suffer through any niggardliness in the use of material, it could hardly be called economy. Wood costs money in proportion to its thickness, and a ¾-in. or even ½-in. piece of oak will do very well for the part under consideration. If, however, it is of this thickness, the front edge must be lined up to improve its appearance, and also to allow of the lid being made a proper thickness—½ in. would not be enough for this, and, as will be seen later on, the lid, and, at any rate, the front of the part to which it is hinged, should be of the same thickness.

In Fig. 3, the piece thickening up the front edge is indicated, though it will be understood it is not necessary if the top is made of 1-in. stuff; in fact, it would only be a hindrance unless the lid were made thicker too. After jointing up any pieces it will be well to let them stand by for a day or so in a dry warm place for the joint to set firm, before using them roughly. The next proceeding may be to plane up and smooth the ends and top (No. 2), after which they and the bottom may be put together. The method of fastening them is by dovetailing. In the bureau we are working from the plain dovetail is used, but as this shows the end grain of the top on the ends, and of the ends on top (see Fig. 5), in which the shaded portions represent end grain, it may be objected to by some who like the neater-looking appearance of the mitred dovetail joint. This, however, is rather difficult of construction, and as an explanation of the method of making it would almost require an article by itself, more need be said about it. One thing, however, may be said in favour of the plain dovetail: that is, it is stronger than the other, and if it is neatly made, there is no real reason why it should be regarded as unsightly. It is primitive rather than objectionable in appearance. Do not fall into the common mistake of making the pins or dovetails—*i.e.*, the pieces of the ends which fit into the spaces cut into the top—too thin, under the idea that they look better when they taper away almost to nothing. In such a case as the present they will look paltry if they are less than ½ in., and may be larger still with advantage. The number of dovetails shown is five, but there is no necessity for adhering to this.

It occurs to me that a bureau would not suffer in appearance by having the pins and sockets equal, but this is merely a matter of opinion which the maker must decide for himself. To some, the last pin, the one nearest the back, may appear a little objectionable, and that it would be all the better for being a little further from the edge, or even omitted altogether, and the end carried up as shown in Fig. 6. At any rate, if this plan is adopted there will not be the same risk of splitting the top that there might be in the other if the pin happened to be fitted into its socket with too much force or unevenly. A very little reflection will show why. Not that such an untoward event would happen in the hands of a skilful worker, but as it might with others it will be as well to avoid the risk, especially as the second method is at least equally good joinery. The bottom should be manipulated in the same way, and should be left

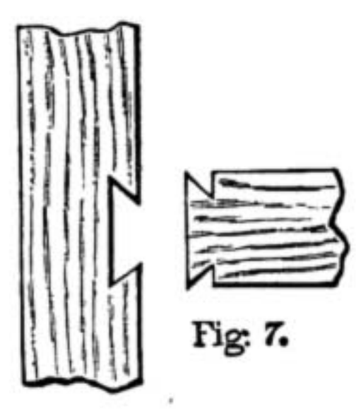


Fig. 7.

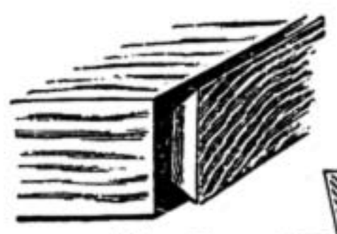
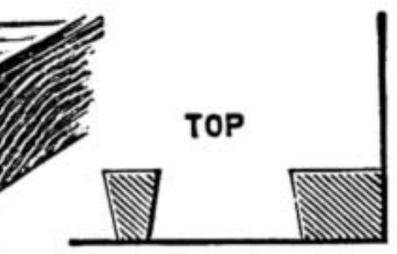


Fig. 8.



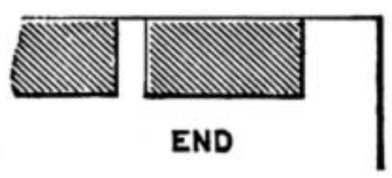
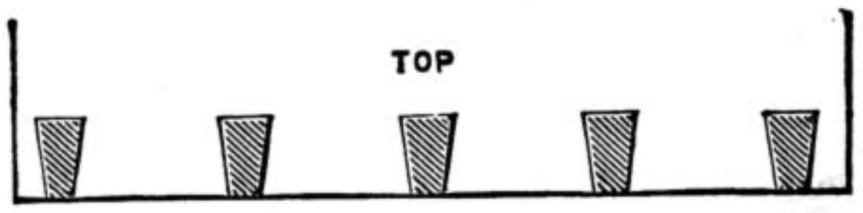


Fig. 6.



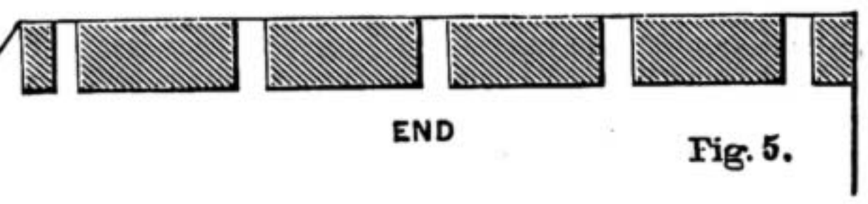


Fig. 5.

Fig. 5.—Dovetailed End of Top. Fig. 6.—Ends and Back: Top Corner. Fig. 7.—Joint for Drawer Bearer. Fig 8.—End for Drawer Bearer.

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projecting a trifle in front—say ¼ in.; if a little more it will not matter, as any surplus can easily be planed away afterwards. These pieces, the ends, top and bottom, should only be fixed together dry as yet, *i.e.*, without any glue. If the dovetailing has been properly done they will hold solidly enough when they are wanted to be together. It will be noticed that the ends cannot be forced outwards from the top and bottom, but that any pressure laterally binds the parts more firmly together, owing to the wedge-like spread of the dovetails. It is of the utmost importance that the greatest care should be taken to fit the top, bottom, and end pieces perfectly square and true, otherwise it will be impossible to fit the drawers correctly, so that they may run smoothly and easily. All corners must be right angles, and the width at the back and front be exactly the same. If there is any doubt about getting them so, let the ends slope a trifle, and it should be but the merest trifle, outwards towards the back. I almost hesitate to say this in case any one should mistake the intention and purposely try to make the back wider than the front. This should not be done. The aim ought to be to get the ends perfectly parallel, so that the space at back and front may be equal, but as this would be perfect adjustment, which it would be almost unreasonable to expect except at the hands of the most expert, the caution is given that any excess in size should be towards the back. Indeed, as a rule, the best workers make drawer carcases in this manner.

Perhaps a few words of explanation may be of service, for what applies to this applies equally in all similar cases, and it is just as well to know the "reason why." It will be remembered that drawers are intended to be fitted into this space. Now, just consider how these would run, or rather how they would stick, if, being properly made—that is to say, of an equal width in front and behind—they were forced into places too narrow for them. Of course, wood not being a sufficiently compressible substance, to squeeze the drawers into a space less in size than themselves they would have to be made to fit. This might be managed by making them out of the square, which certainly is not satisfactory, or the fronts would have to be made no larger than the backs, which is hardly an improvement. Mind, I do not say that the drawers would be altogether unserviceable, for if this were so, many a comparative novice might be discouraged from attempting the work. No; they would probably be serviceable drawers, but they would not run easily and smoothly; in other words, they would fit badly, besides being unsightly. Now, if the ends of the carcase spread ever so little outwards to the back, the drawer fronts may be fitted tightly to the front, and the drawers being fairly made, they will run firmly and smoothly without either jambing or wobbling. This is the result to be aimed at, but there are various degrees of excellence between the drawer that fits almost air-tight and yet moves easily, to the drawer that requires a most carefully equalised pull or push to move it. We all know the latter—don't we?—the drawer that starts so easily, but so soon sticks fast, and won't move further till it has been pushed and pulled, first at one end and then at the other. Such are not nice, but they are not worthless; so if all the drawers in the new bureau won't work as they should, do not be unduly despondent. A drawer is not the easiest thing in joinery to make, and if you only get them to run moderately well, be satisfied; but try to do better next time.

In making the bureau, the next thing may be to fit the inner top and rails, or bearers between the drawers, as in addition to the drawing, we have now the ends set up to guide us. It will be noticed that the drawers are graduated in depth, the two short drawers, immediately under the top, being the shallowest, and the bottom one the deepest. The spaces must be accurately set out on the ends, lines representing the thickness of the rails being drawn across their inner sides. The rails are fixed into the ends by dovetail joints, but if this is considered too much labour, a very serviceable plan is simply to dowel them, or even to use the mortise and tenon joint. The best way is, however, undoubtedly to dovetail them. There are several ways of going about this, or rather modifications, but I don't know that any are better than that in the old bureau. The dovetail is cut at each end of the rails right across, and fits into a correspondingly shaped groove in the end pieces (Fig 7). It is obvious that these rails must be pushed in either from the back or from the front till they are in position, and equally obvious that it will be simpler to do so from the front. Now, if they were pushed back till their edges and those of the ends lie flush, it, the dovetail, would show, and it is to hide this that the facing slips mentioned in the remarks column against No. 1 in the wood list are required. Some may prefer that the dovetails should show, and there is no reason why they should not be visible, if they are made as they should be, neatly.

There are, indeed, I may say, critics of woodwork who go the length of saying that it is bad form to hide or conceal any detail of construction. They prefer that methods of construction should proclaim themselves. Of course, those who think so have no need of the facing slips, but I think these will be an improvement. But perhaps it may be said by some who admire the style of joinery that would show all the construction, "because it is so honest, you know," that any concealment is a modern innovation to hide bad work. Truly, if they are correct, there is very little indeed now made that is good. Is it, however, the fact, that to cover up joints, and, by so doing, improve the appearance of a piece of furniture, is an indication of "scamped" work? I say, and so will any one who is acquainted with fair modern woodwork, most emphatically, No! Our ideas of good finish have enabled us to improve on old forms, good enough in their way, but, after all, somewhat rough and crude. It may, however, freely be conceded that it is not the primary object of a piece of furniture to proclaim every detail of its construction to those who are only superficially acquainted with joinery. Perhaps this is where the difficulty is felt by more than one of those who affect to despise modern work, and would have us return to antiquated construction. They can understand the latter, but the former requires more knowledge than they possess. Yes, my theoretical friends, that's the reason for most of your ecstasy over pinned-through joints and other barbarities. I yield to none of you in my admiration of good sound work, but there is no reason why elegance of finish should not be added to it. If it is thought that the slips are not an improvement, do not use them, but it may be said they are on the bureau which is described. As it, to all appearances, dates from the end of last century, and it is certainly not less than eighty years old, in copying it, even the most enthusiastic admirer of our great-grandfathers' work won't be doing violence to his principles. As eighty to one hundred years ago may not seem sufficiently remote to entitle the bureau to be called "old," I may say that the age of articles of furniture is often very much exaggerated in popular ideas by those who have not studied the subject. For example—and it is only one of several similar which have come under my notice—a sofa was once shown me which its owner stated was made during the reign of Henry VIII. Unfortunately for the accuracy of this date, the sofa was made of *mahogany*, and the style of the work showed it to have been made some years after the time "when George the Third was King." Yes, an ordinary piece of furniture which was made a hundred years ago may fairly be called "old"—not antique, perhaps, but still old. Very little furniture, indeed, is as much as 300 years old. The cabinet-making industry was not an extensive one in those days; such as it was, it ran principally into chests. One or two of them may be useful and interesting, but they are apt to become monotonous if one wants to furnish a room with genuine Elizabethan stuff, even though one might be fortunate enough to pick up a settle, a cabinet, and a chair or two to correspond. Sideboards, easy chairs, and the hundreds of convenient forms of furniture now so common, had then no existence.

But, through this digression, the bureau is being temporarily overlooked. We were at the rails, about which it only remains to be said, that if facing slips are to be fixed to the ends, due allowance must be made for them. Perhaps it will save trouble to decide on the exact thickness of these slips at the present stage. They are nominally ¼ in. thick, and must be the exact thickness of the ends in width. Well, whatever the thickness of the slips, cut away just so much from the dovetails on the front edges of the rails so that, when all is fitted up, these and the front of the facing slips will be quite flush. Fig. 8 shows the end of dovetail cut away. The lowest bearer, the one immediately above the bottom board, need not be fastened in so elaborate a manner, but may be simply cut to fit within the ends and lie on the board, to which it can be fastened by a few screws. The effect of this rail is to thicken the bottom board at the front; and the reason why the board was not to be trimmed off flush with the ends may now be perceived, though it will be still more obvious, a little later on, when we come to consider the plinth.

(*To be continued.*)

PAPIER-MÂCHÉ.

How to Mould It, and how To Ornament it.

BY SYLVANUS WARD.

III.—DECORATION—MATERIALS AND APPLIANCES—JAPANNING—PEARL INLAYING—GILDING—DEAD GILDING—DESIGNS FOR DEAD GILDING—RAISING COMPOSITION FOR DEAD GOLD—WORKING FRET PATTERNS IN GOLD.

Materials and Appliances.—Of these the most important required for the decoration of papier-mâché are:—

Black japan varnish, which is dark and thick like treacle. It is inexpensive, and is bought by the gallon (price 3s. 3d. to 3d. 6d.) at such shops as Thornley's, 6, Snow Hill, Birmingham. Copal varnish costs from 10s. to 16s. per gallon. Japanners'

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gold size costs 9s. per gallon. Ordinary tube oil colours, brunswick black, turpentine. Gold leaf, deep and pale; silver leaf, bronze powder of different colours. Also gold powder, if the worker thinks that he can afford so costly an appliance; but as it costs some £5 per ounce, and bronze 10d. only, most persons will content themselves with the humbler substitute, notwithstanding the greater and more permanent brilliancy of the gold.

Pearl, for inlaying. Of this there are three standard kinds:—1. White pearl. 2. Scotch or snail pearl. 3. Aurora pearl. The white is obtained from the shell of the large pearl muscle, the same from which pearl buttons are made. It was the first kind used, and was originally very costly. This is to be procured in the largest pieces, and is, therefore, employed in inlaying on a large scale, as in the squares of chess boards, etc. It has less iridescence than the other varieties, and is lower in price. Snail pearl has a pleasing blush, and colours nicely varied. It is to be had in fairly large pieces. Aurora pearl is obtained from a univalve, auriform shell. It is of finely varied colour, but the pieces are comparatively small. There is also a fourth variety, which has a beautiful iridescence, green being the prevailing hue, but it is less apt than the other three to be sound and reliable. The pearl shells are reduced to flakes by grinding by persons who make it their business to prepare them for inlayers. Pearl may also be procured from these persons stamped out into certain stock forms, such as discs, diamonds, stars, roses, vine leaves, shamrock leaves, bells, etc. These will be in snail or aurora, white not being showy enough for such small matters. By judicious combination, pleasing designs may be formed from these stock shapes. Pearl is purchased by the ounce.

Brushes—a thin sable, an inch long, for fine and moderately thin lines, known to japanners as an "etcher;" also a somewhat thicker sable, half an inch long, known as a "sprigger." In selecting a brush it should be held up to the light, and the thumb nail pressed against the bottom of the hair; this, if the brush is a good one, will cause the top to spread out evenly, and the ends of the hairs will alike be fine. If many thick, blunt hairs appear, reject the brush; if there are only two or three thick hairs they may be removed with the points of a sharp pair of scissors. Wet the brush (the colourman usually has a cup of water at hand for that purpose), and see if it then comes to a good point. Sometimes a brush, otherwise satisfactory, may appear to have too fine a point, owing to one or two hairs projecting beyond the others. This defect may be corrected by laying it on any flat piece of wood, and carefully removing so much of the hair as causes the weakness with a keen penknife.—[N.B. The above remarks may be useful not only to papier-mâché decorators, but to others who use fine brushes.] A camel-hair pencil of the same size as the "sprigger" will also be needed for "pencil varnishing." For laying the transparent varnish over larger surfaces one of the broad, flat, camel-hair brushes sold as "varnishing brushes" should be had; one at about 9d. will suffice. A large round brush will also be wanted for japanning, that is, for laying on the black varnish.

Pumice-stone, rotten-stone, hard and soft, whiting, and a little olive oil, will also be wanted for polishing. Most, if not all, of these requisites may be obtained at the shop above mentioned.

Japanning. — The article being taken from the linseed oil bath is set on a tray to dry, and when oil no longer appears on its surface, a coating of black japan varnish may be brushed over it. Such an article as a vase or a spill cup may be japanned all over at once, but a flat thing, like a tray, after japanning on one side needs to be dried before the varnish is put on the other side. The stove, or oven, in which it is placed should be slightly warmer for this than for drying paste. When dry the coating has to be, to some extent, removed by scraping with a plane iron drawn backwards. So much of the varnish has to be taken off as will remove all gloss, and so much left as will form a ground for after processes.

Should a hollow show itself at this stage it must be filled up with paper dust and black varnish (a mixture technically known as "bomption"), drying it, and scraping it level. In japanning, the worker is tolerably sure to blacken his fingers freely, but the varnish may be readily cleaned off with tar spirit.

If pearl inlaying is intended the papier-mâché is now ready for the first stages of that process, but as the art of japanning can be most clearly described by going straight on with it to the end, we will consider the article under treatment to be intended for gold and colour decoration only, and deal with pearl inlaying later on.

Such, then, being the case, the use of the black varnish has to be continued, drying after each coat, and rubbing down all knots and air bubbles with pumice-stone before the succeeding coat is laid on. Three coats are usually sufficient. To prepare the last coat for decoration it should, after the usual pumicing down, receive an extra rubbing with picked (the finer) pieces of pumice-stone. It has then to receive a still further smoothing by being thoroughly rubbed over with a large bob made of rag, and what is technically known as "sand," that is, pumice-stone pounded very fine in a mortar, and applied wet. After this comes a rubbing with wet, crushed rotten-stone, applied with a smaller rag bob, which application must be continued till all cuts and scratches left by the pumice-stone are rubbed out. If *dead* gilding is to be employed the surface is now ready for it.

If, however, as we will assume, *bright* gilding is to be used, the surface which has now been thoroughly *smoothed* has also to be *polished*. This must be done by rubbing with the palm of the hand and finely powdered *dry* rotten-stone, and afterwards in the same way with whiting, and just a spot of olive oil after this. Care must be taken that there is no grit in the whiting, or it will make scratches. A soft, flat palm gives the best polish, and if properly done a most brilliant jet-black surface will be the result. We now have the proper surface for *bright* gilding.

The different stages of the work at which it is proper to apply pearl, dead gold, and bright gold, have now been shown, and I may next proceed to describe those processes.

Pearl Inlaying.—When this art was first introduced the practice was to cover the required surface of the pearl flake with some acid-resisting paint, such as asphaltum, and then to bite out the form with acid, a process patented by Jennens & Bettridge, of Birmingham, but it was afterwards found that the pearl might be cut. Rectangular forms are best cut with a sharp knife, such as that used by shoemakers for leather, which has been converted into a fine saw by drawing it against a file. Simple curved forms may be cut with scissors; soaking the pearl in water makes it cut more easily, and lessens the danger of breakage. For cutting intricate forms, a very delicate and minute fret saw must be used. Formerly, it was usual as a means of preventing breakage whilst sawing to glue the pearl to a sheet of thin metal, but the later practice has been to glue several flakes together, sometimes as many as six, and to saw through them all at once. The flakes are afterwards separated by soaking in hot water. If the cutting is not quite accurate, any little inequality can be concealed at a later stage of the work with black paint.

Pearl may be used in several different ways—for covering the entire surface, for diapers and set patterns, for forming buildings, for giving brilliancy and richness to fruit and flower subjects, to the wings and breasts of birds, to insects, etc. In all these it is employed in combination with more or less painting or gilding, or both.

To cover the entire surface with pearl is a simple mechanical matter, demanding only neatness and accuracy. It is easy to lay out the ground in lozenges or other rectilinear spaces, as in Fig. 22, and to cut the flakes of pearl to fit them, variety being attained by placing white and snail alternately, or, if the figure should not exceed a square half-inch or so, aurora also may be employed, the pieces of this pearl being too small for larger patterns. On a flat surface this is simple work, but if it has to be carried over any slight curvature it becomes difficult, and will be best accomplished by cutting the pearl into strips; even then it may not be found easy to make good joints. Before laying the pearl in place, japanners' gold size has to be spread over the surface to fix it. The black-lead lines drawn to indicate the pattern will show through the size.

Fig. 22 gives a design for this "solid" pearl inlaying, in which the size of the component spaces is so considered as to allow the employment of all the different kinds of pearl. The letters, W., S., A., and G., indicate those for white, snail, aurora, and green, respectively. The dotted lines show where the larger spaces may be subdivided if desired without injury to the effect of the design; and it is well to remember that pearl lies flatter and better in small pieces than in large ones.

Diapers and set patterns, made with stock or other forms in pearl, require to be first laid out with black-lead lines. A design of this character is shown in Fig. 23. In this the strips of pearl forming the border would be cut with the roughened knife mentioned above. The other pieces of pearl are common stock forms. The dotted lines represent lines drawn in black lead, on which to arrange the diaper.

In inlaying for flowers, fruit, etc., a solid piece of pearl is laid where the flower or other object will come, and the exact form left to be made out afterwards in the painting, which will be with transparent colours.

In blocking out buildings in pearl, more care is desirable. It is well so to arrange the joinings of the pieces as to make them fall in places where they will be least seen—as, say, along the perpendicular lines at the corners of the structure, the horizontal ones at cornices, string courses, etc. In Fig. 24 the black lines show where the joinings ought to fall, and if further joinings should be found necessary, the dotted lines indicate where others might be carried with

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little injury to the effect of the work. The narrow ragged strip at bottom of the tower shows how scrap strips from the sawing-knife operation may be made of use.

After the pearl has been put upon the sized surface, the article should be placed in the stove for the night; the gold size will take rather longer in drying under the pearl than where exposed. As the flakes are often not absolutely flat, it is probable that in the morning one may occasionally be found to have "sprung." If so, work a little paste into the hollow beneath it with the finger, and put a weight upon it. But in doing this, be careful not to let any superfluous paste remain round the edge of the pearl, or it will cause the varnish, which will afterwards be laid on, to crack. After half an hour in a coolish stove, the "spring" will be found to be set and firm.

When the pearl is fixed, another coat of the black varnish has to be applied to the entire surface, covering pearl and all, and, after stoving and drying, this has to be pumiced down till the pearl is cleared. Then the worker has to varnish again, and so to repeat the operations till japan and pearl present a perfectly level surface. Three coats will generally do this, but something will depend on the thickness of the pearl; white pearl, which is thick, will require more than the thinner aurora. Where two kinds of pearl are used together, the thicker may be filed down, or, in the later processes, be pumiced down, to bring it flush with the thinner; but this, by-the-bye, will be at the risk of some of its brilliancy.

A level surface having been reached, it has to be smoothed and polished as above described, just as if there were no pearl. If *dead* gold has to be used with the pearl, it can, as already mentioned, be applied after smoothing and before polishing, though it can be also applied upon the polished ground. If *bright* gold, this *must* be laid on after polishing. We will suppose both smoothing and polishing to be done, so that we shall now see the pearl shining out from a brilliant jet-black ground, to all appearance a perfect example of inlaying, though, as we have seen, the process by which this effect has been reached cannot accurately be called inlaying at all.

When pearl and gold come in close contact, the gilding must be done before the pearl is finished. For convenience of description, however, it will be desirable that finishing the pearl should first be spoken of. If any little flaw appear in the pearl, or if it should have been worn through in any part in the pumicing, the fault will have to be repaired by touching with what is known as "mending" or pearl colour; this is a mixture of flake white, crimson lake, a little black, and a little blue. It is important to remember this mixture, as in all cases of pearl inlaying it will probably be wanted.

This "pearl" or "mending" colour will also be necessary in painting buildings, since, in them, the joinings of the pearl have to be hidden, and there are often little projections, such as those made by crockets and finials in Gothic buildings, which it is not possible to cut out in pearl, and which, therefore, have to be painted in this colour. At Fig 25 we have a pinnacle: A, shows the plain outline laid in with pearl; B, shows how its crockets and finial have afterwards been added in mending colour. If, however, such details should be of any appreciable size, little pieces of "scrap pearl," *i.e.*, the odd pieces which break off in cutting, may be laid in to form them, and afterwards be brought to the required shape with colour. And it may be mentioned that there are other ways in which "scrap pearl" may be found useful in decoration, of which I may have occasion to speak later on.

It will sometimes be found that, during some of the stovings to which the work is subjected, a pearl form may have slipped somewhat from its place. This will probably be owing to too great a flush of gold size beneath it, which has been temporarily softened in the stove. Such an accident is indicated by the dotted circle at C, Fig 23. There is no way of actually restoring the pearl to its place. What has to be done is to block out with black, as at A, that part of the pearl which has passed its proper limits, and to add with pearl colour so much of the form as is wanting at B. If this is neatly done the defect will escape any ordinary scrutiny. All little slips of this nature are to be corrected in the same manner.

When the entire surface is covered with pearl, a mere line, generally of white paint, drawn neatly over the joinings, is all the finishing required. Some diapers and set patterns will perhaps need nothing more to render them sufficiently decorative than the mere correcting of irregularities of outline with black paint (vegetable black). Others will need more work. In such patterns, for instance, it is often desirable to connect small forms by thin lines of

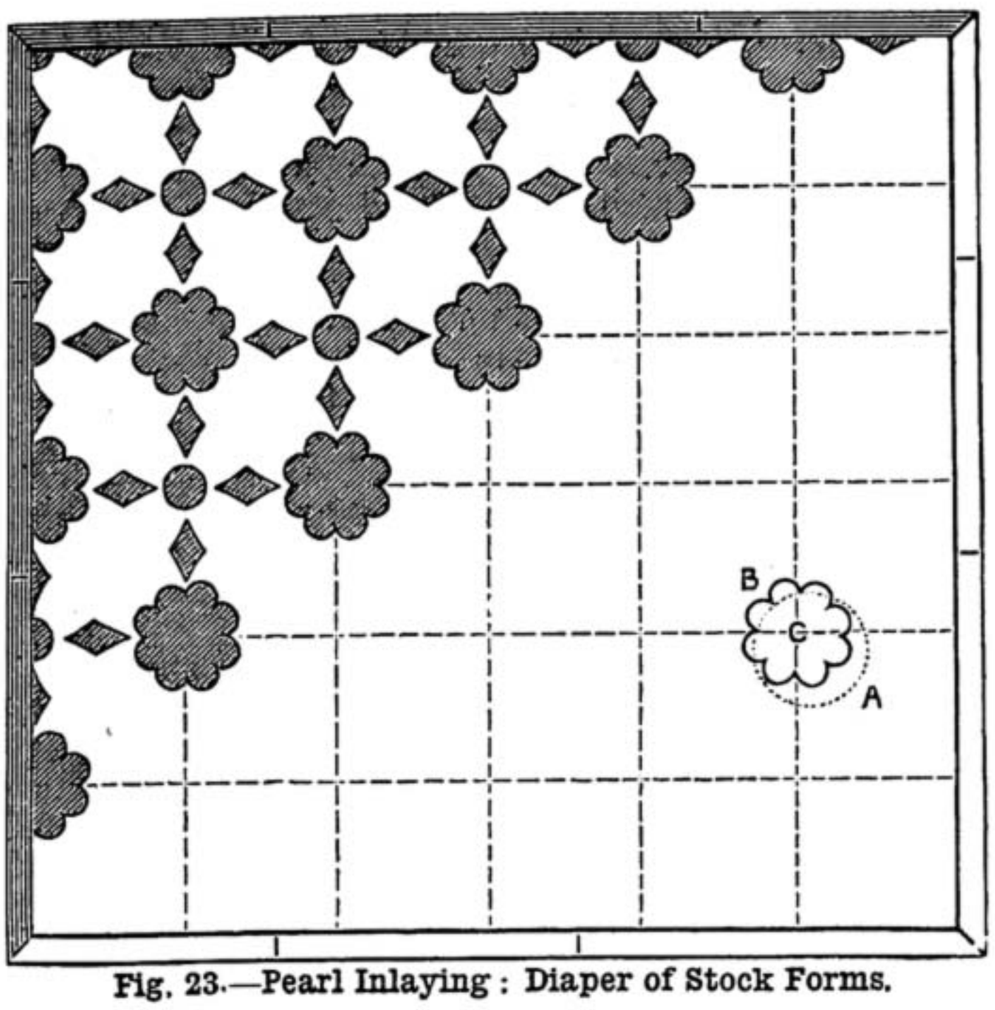


Fig. 23.—Pearl Inlaying: Diaper of Stock Forms.

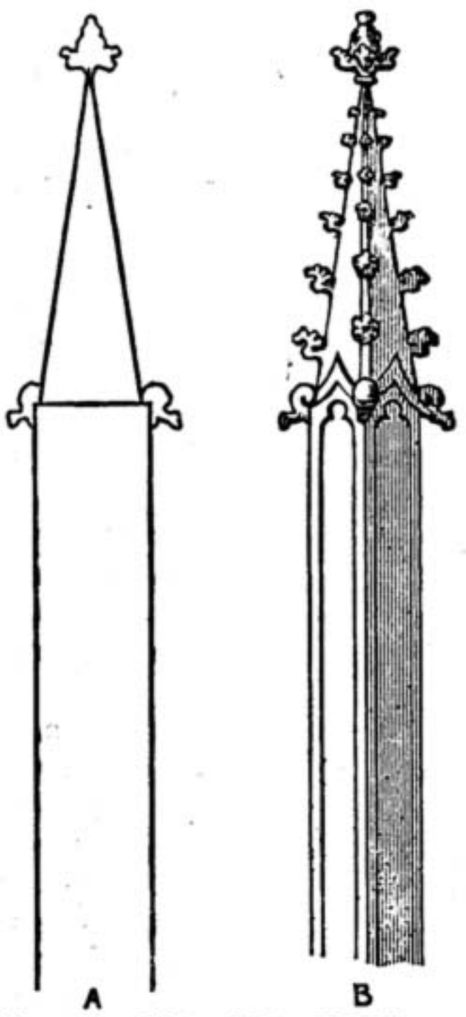


Fig. 25.—Use of Pearl Colour.

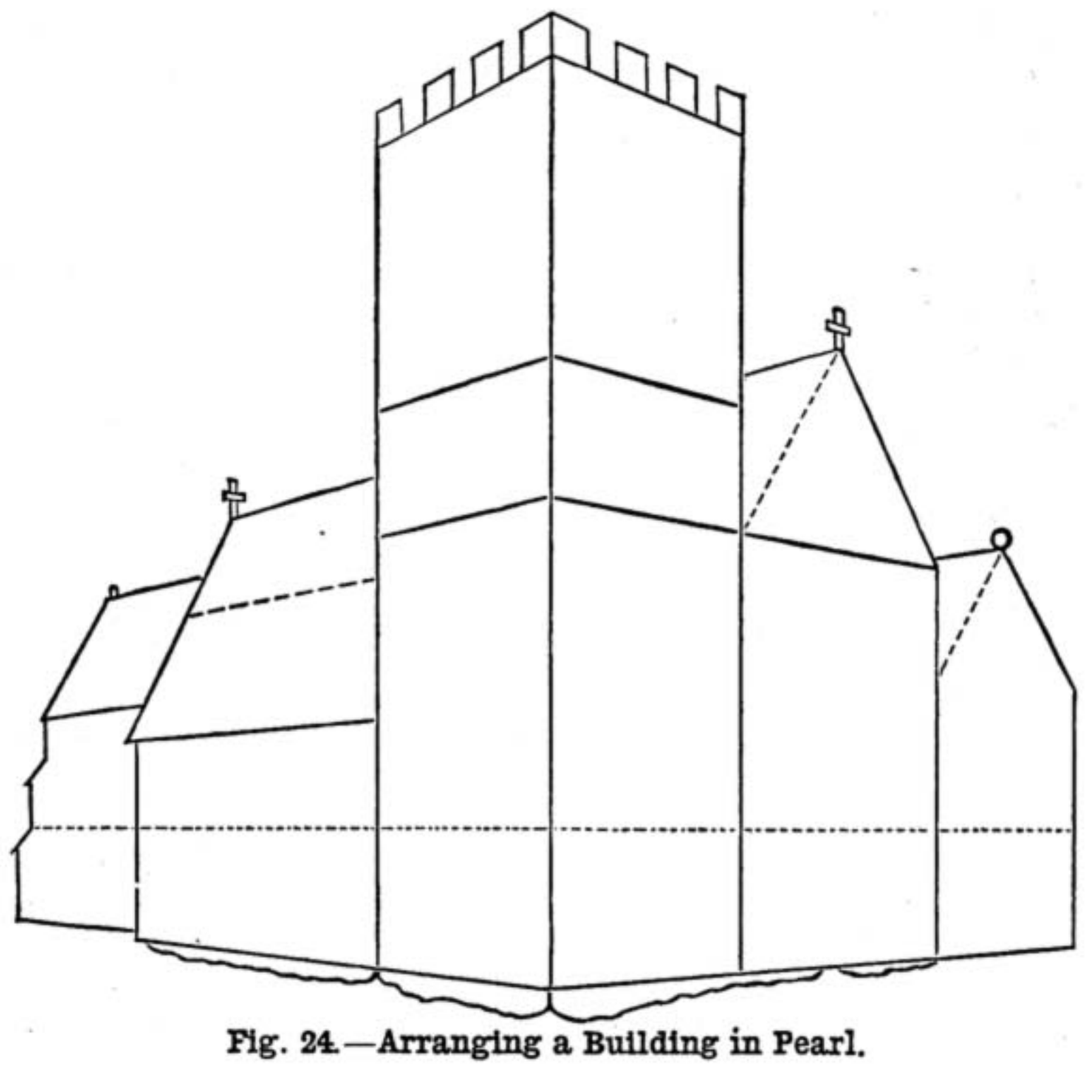
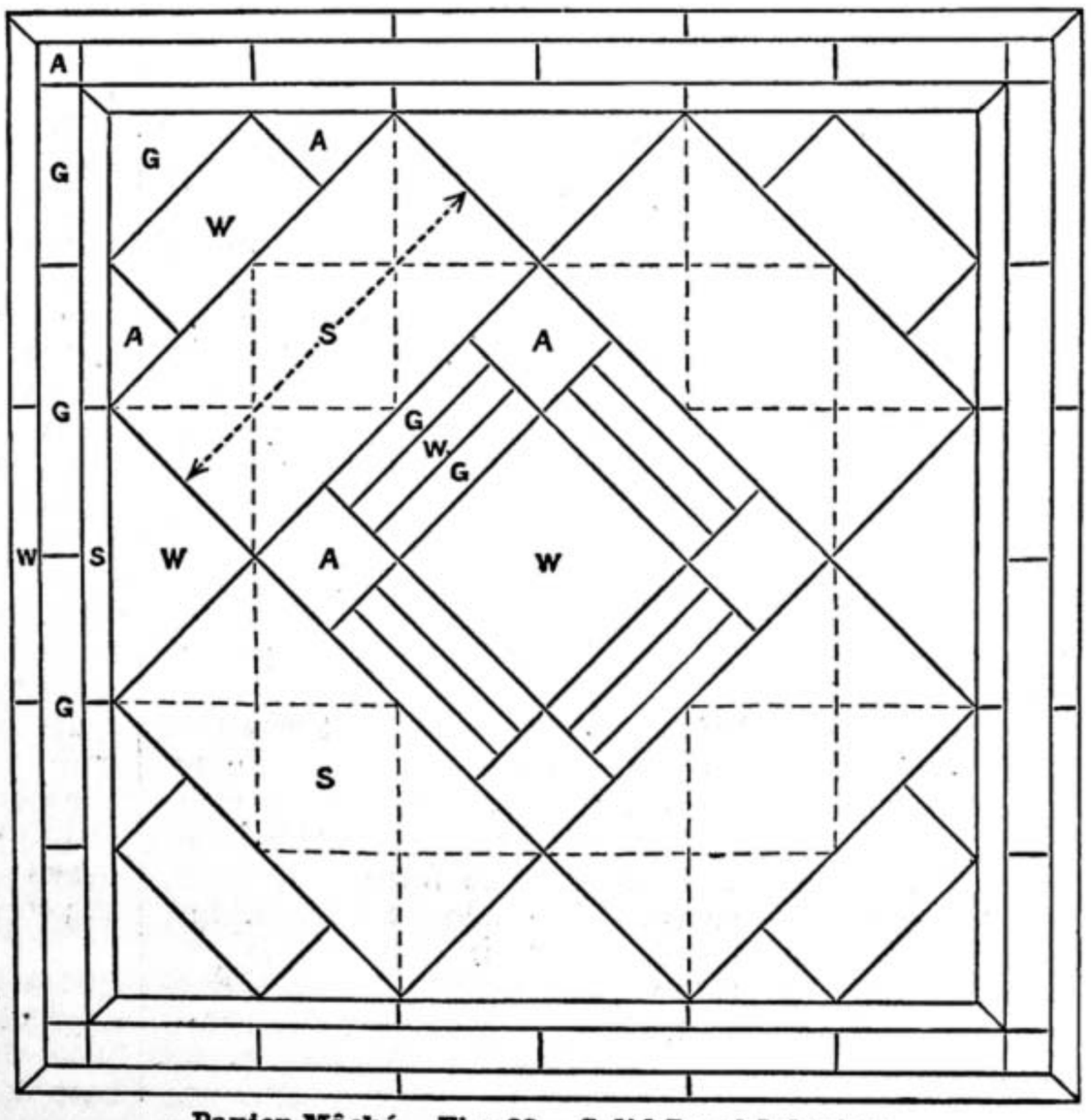


Fig. 24.—Arranging a Building in Pearl.



Papier-Mâché. Fig. 22.—Solid Pearl Inlaying.

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pearl. Now thin lines cannot well be cut; it is necessary to make the strips of pearl somewhat broader than is desirable for effect, but they can now be lightened and made to look thin by drawing a black line along the middle of each.

Some description of the methods of painting and finishing buildings, flowers, figures, etc., on pearl, will need to be given, but this will, for sufficient reasons, best be deferred till the more elementary processes of gilding have been dealt with.

Papier-Mâché. Fig. 26.—Simple Design in Dead Gold.

Gilding.—The gold leaf used on papier-mâché is the same as that employed by gilders generally. It is of two colours, deep and pale, the latter owing its lighter hue to an alloy of silver. Gold leaf is purchased in books of 24 leaves, 3 inches square, and costs from 1s. 2d. to 1s. 6d. per book. There is beside these a green gold which might be used as a variety; it is, however, more in favour in France than with us, being rarely seen in this country. A cheap substitute for gold leaf is Dutch metal, which is sometimes used in inferior japanning work, and which may be bought at 2d. or 3d. a book.

Dead Gilding.—It has been mentioned above that the proper surface for *dead* gilding is that before the polishing with hard rotten-stone and whiting. It is indeed possible to do dead gilding upon the polished surface, but chrome yellow or some similar colour has then to be mixed with the gold size to enable the worker to see what he is doing; and as this tends to weaken the size it is undesirable, unless the nature of the work requires it, as is the case when bright and dead gold are intermixed.

The design should first be drawn on paper and transferred to the papier-mâché by pouncing—that is, by pricking holes along the lines and dusting whiting through; no more whiting should, however, be used than is necessary, or it will make the outline ragged. The design is then to be pencilled with a sable brush in japanners' gold size. The gold leaf is to be laid on when the size has so far dried as to be merely "tacky," which will be in from one to three hours, as the size may be quicker or slower. To hasten drying the sized article may be held to the fire and then let cool again; to retard drying it may be put in a cool place, also a drop of poppy oil mixed with the size causes it to dry less quickly. A gilder's "tip" can be used if the worker is accustomed to one, and can apply gold more readily in that way than any other; if not, as the surfaces to be dealt with are all comparatively flat, most persons prefer to cut the book of leaf into convenient pieces, and to lay on the gold with the paper of the book. The leaf has to be pressed down in the usual way with a little ball of cotton wool, and superfluous gold dusted off with the same. Should any gold adhere in wrong places, as for instance to the ground, owing to a little greasiness from a finger touch, it may be removed with the wetted corner of a silk handkerchief.

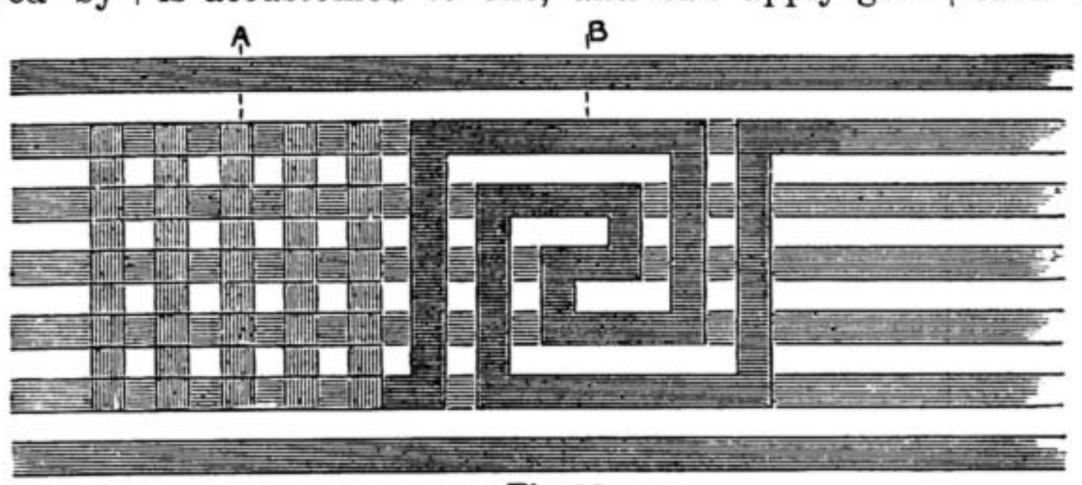


Fig. 28.

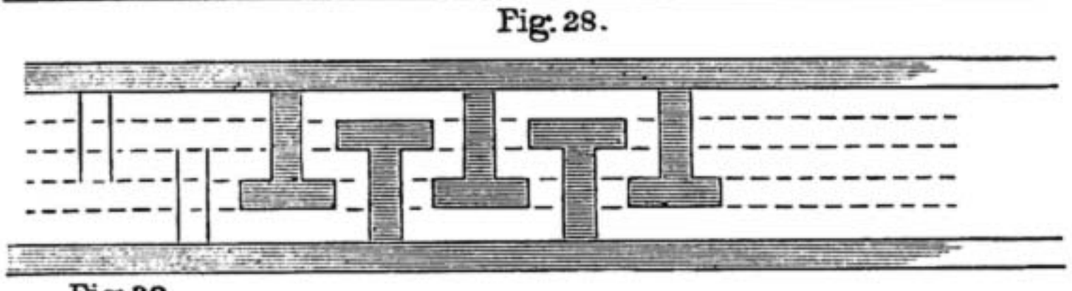


Fig. 29.

Fig. 30.

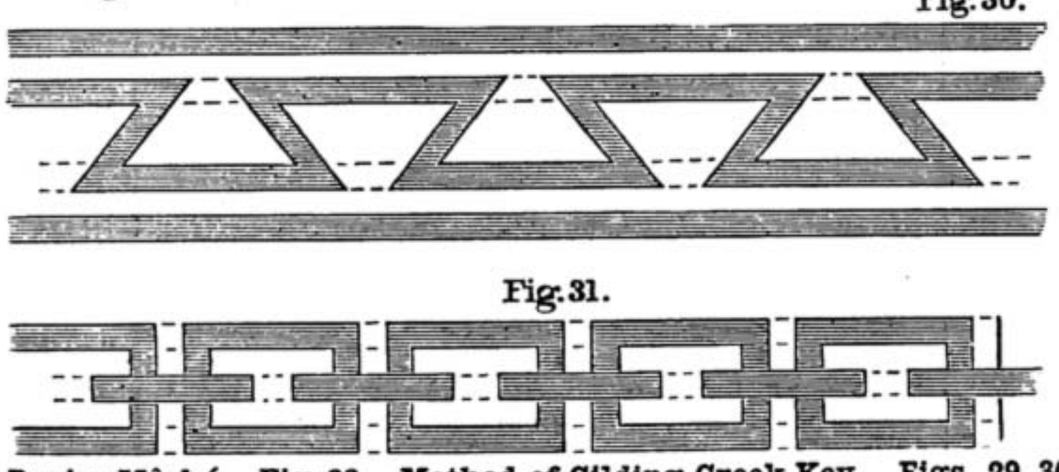


Fig. 31.

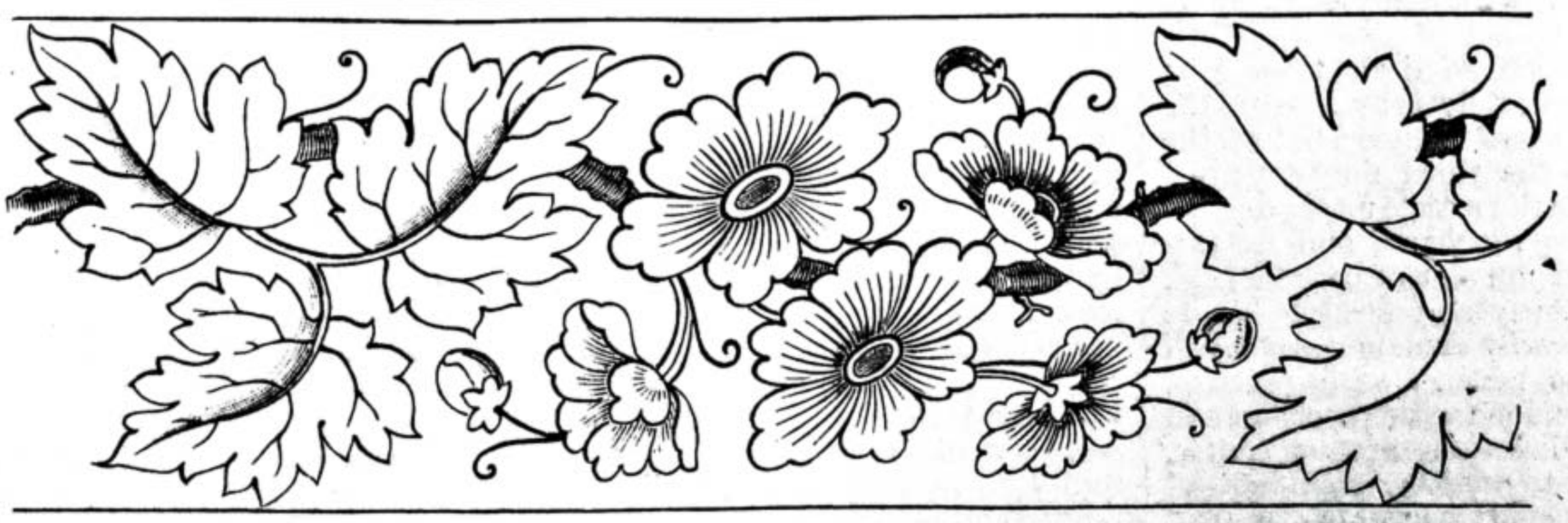
Papier-Mâché. Fig. 28.—Method of Gilding Greek Key. Figs. 29, 30.—Method of Gilding Frets. Fig. 31.—Method of Gilding Chain Fret.

If, as in the design for dead gilding in Fig. 26, both deep and pale gold are used, the processes of pencilling, laying on the gold, and drying have to be gone through *separately* for each colour. The deep gold being of the most importance is generally applied first.

A day or two is sufficient to dry gilding, or less time in a stove of low temperature, and it has then to be protected by varnish. If the gilding covers but a small part of the surface, it has to be pencilled over with transparent varnish—usually copal—care being taken to put as little as possible on the black japan beyond the gold. The japan will not polish so well where the varnish goes. Nevertheless, if the gilding covers a great part of the surface, it is usual to go over the whole with the broad varnishing brush. If a loose hair from the brush should get entangled in the varnish, it should at once be removed and the place smoothed over.

If, however (as is the case in the designs for dead gilding, Figs. 26 and 27), the effect depends less or more upon "cutting-up" with black lines, this work must be done before varnishing; so also must any correction of outline which may be required. It should be borne in mind, however, that in this latter particular as little as possible should be left to need correction, for the black paint now applied will never equal the depth of the black japan. The paint to be used may be ordinary tube colour (vegetable black) mixed with varnish. The older plan was to grind the colour in turpentine and then add varnish; this cost more trouble, but it dried more quickly.

When the varnish over the gilding is thoroughly dry, the whole surface has to be polished. It has first to undergo a slight rubbing with the bob and soft, wet, rotten-stone, and afterwards one with the hard, dry, rotten-stone, whiting, and a spot of oil, as already



Papier-Mâché. Fig. 27.—Border in Dead Gold.

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directed. This is, indeed, the method of finishing all decoration on papier-mâché, as will be noted more particularly farther on.

Fig. 26 is a simple pattern in deep and pale dead gold from old japan work. In this it will be seen that the gilded forms are very little "cut up" by lines of paint—the cutting up being confined to the fibres of the leaves and a single line up each petal of the flowers. The thin stem work, the leaves, and the centres of the flowers are in deep gold; the petals of the flowers, the balls, and the thick portion of the stem are in pale gold. The little shading seen is in wash black.

Fig. 27, also from old japan work, is a running pattern in dead gold, for the edge of a tray or any similar use. In this, the cutting up is much more elaborate. The border lines, as well as the stems, leaves, and centres of flowers, are in this design in deep gold; whilst the petals of flowers are in pale gold. The shading, as before, is in wash black.

Raising Composition for Dead Gilding.—In old japan work it will be observed that some parts are occasionally considerably raised above the general ground, as in such objects as the bodies of butterflies, the front petals of flowers, etc. To effect this, a mixture must be made of whiting, flake white, and gold size, of somewhat greater density than treacle. With this the form to be raised has to be painted in with a camel-hair brush, care being taken to keep the brush well charged at the point, so that the composition may the more readily flow upon the surface of the papier-mâché. This raised work has to be dried, and if necessary pumiced a little to correct roughness. It may then be sized and gilded in the ordinary way. This work must be done on a dead, not on a polished, surface, since on the former alone will it properly take hold, and it is always used in connection with *dead* gold.

Working Fret Patterns in Gold.—Both in old oriental and in English work, we not uncommonly meet with varieties of the "fret" ornament in gold, used as borders, and when so used always looking well. In the East, where time and labour are of little value, designs of this class are pencilled in line by line, but English japanners have adopted a shorter method. For instance, the "Greek Key," Fig. 28, is produced by the worker first drawing a series of lines (in this case seven, inclusive of the two border lines) with his pencil and gold size. He then crosses the five central ones with other lines at right angles, as shown at A. The whole has then to be gilded at a single operation, and the parts of the lines not needed for the pattern, as shown by the dotted lines at B, are afterwards blacked out. By this same process of lining and blacking out the different frets shown in Figs. 29, 30, and 31, with many others, may also be produced.

The way in which to draw these long horizontal lines accurately is by holding the hair pencil in the usual manner, but at the same time placing the third finger against the straight edge of the article under decoration. This steadies the hand, and by this means the required number of parallel lines may be drawn slowly and firmly. To do such work satisfactorily demands some skill in the use of the pencil; with practice, however, it may be done with precision and rapidity. These directions are, of course, supposed to apply to working frets in dead gold. In bright gold (of which I shall next have to speak), frets may, however, be worked in the same manner, except that, instead of blacking out, the superfluous gold will then have to be removed with a wetted box point.

(*To be continued.*)

NOTES AT THE ARCHITECTURAL AND BUILDING TRADES' EXHIBITION, 1889.

(*Continued from page* 155.)

MANY an individual, nowadays, when looking at the mantel with which his dining- or drawing-room is embellished, rests fully content in the conviction that the said mantel is marble, and that of an exceptional quality too. Such a display as that set up by Messrs. Corfield & Morgan, Tredegarville, Cardiff, would, however, be to those confiding individuals what is vulgarly called an "eye opener," for there were to be seen various productions in enamelled slate, which it would need an expert connoisseur to distinguish from marble itself. If people are determined to have the beauty of marble, and yet cannot afford the price for the real material, Messrs. Corfield & Morgan's enamelled slate offers itself as a remarkable substitute; and for those whose means will go to the genuine article, that firm are in a position to fulfil any commission entrusted to them.

The display of marble chimneypieces, enamelled slate chimneypieces, tiled stoves and hearths, iron mantelpieces, overmantels, and other goods of that description which bore the name of Messrs. Betts, 33, York Street, London Road, S.E., was most comprehensive in its way, and several of the designs shown by that firm gave pleasing evidence of the great strides made in that section of the hardware trade of late years.

An interesting novelty, and one which is likely to make its way in the market, was shown by the Ambrose Patent Bedstead Company, 16, Newgate Street, E.C. As the style and title of the company indicates, the invention is named the "Ambrose" patent bedstead, and it possesses many advantages of really genuine value. One of the chief objections urged against the old wooden bedsteads was the difficulty of keeping them clean, but many people have refused to adopt iron ones, in consequence of their more hard and ungraceful appearance. It is just this aspect of the matter which has been adopted by the inventor of the "Ambrose" bed, and we must say that the result of his cogitations may be looked upon as a most "happy medium." This new invention is introduced with the object of supplying a bedstead which, while perfectly free from the objections met with in the old wooden ones, at the same time combines the comfort and elegance found in them with the cleanliness, durability, and cheapness of those made of brass or iron. The head and foot are composed of various woods, turned, carved, or otherwise decorated, while the frame and laths are entirely of metal, thereby ensuring the utmost freedom from anything objectionable. Owing to the extensive adoption of metal bedsteads of late years, the woodworker has been debarred from exercising his talents on that indispensable article of furniture. But, by this new invention, the cabinet maker would once again have an opportunity to make the bedstead "a thing of beauty and a joy for ever;" and even if it were only for that reason, the "Ambrose" bed should receive the heartiest welcome from all who have to use such an article.

The decoration of glass is a field which has enticed many inventors, and numerous are the methods by which plain glass may now be so manipulated as to rival stained glass more or less successfully. It is to Messrs. T. Baillie & Co., 187, Wardour Street, W., that we owe the latest invention in that direction, and the examples which they had on show at the Agricultural Hall proved conclusively that the "Valère" translucid enamelled glass, as their production is styled, will constitute a formidable rival to other materials of a like description. The novelty of this patent rests in the fact that the enamel is translucid, rendering both sides of the glass decorative, so that windows, screens, etc., display a rich effect on whichever side the light plays. At night, when illuminated by artificial light, the effect is specially charming, as the enamels appear translucid from the outside, while from the interior they have exactly the appearance of opaque enamels. The beauty of the tints and the variety of treatments which these enamels permit of place them very high, and they would be particularly valuable for such purposes as heraldic decorations on windows and in other similar associations.

Other exhibits were, of course, to be seen in large numbers, but those chosen for notice herein have been fairly representative, and with them we must conclude this necessarily brief report.

WROUGHT IRON AND STEEL GIRDER WORK.

BY FRANCIS CAMPIN, C.E.

STRAIGHTENING AND BENDING PLATES AND BARS.

PLATES which are required to be finished with curved edges may be ordered from the rolling mill of the most convenient shape from which to cut it out, but its edges will have to be straight lines, though its corners need not necessarily be square. Although plates ordered to special forms will cost a little more than ordinary rectangular plates, yet where the waste in the bridge yard would otherwise be large and extra labour required, it is the most economical course to pursue.

The curve to which the edge of the plate is to be formed having been accurately marked upon it, as much of the superfluous material as is convenient is taken off in a shearing machine, and the edge finished with a chipping chisel.

There is a point in connection with the setting out of bridge plates to which the attention of the operative must be directed, otherwise he may get wrong. Girders in single spans are usually made with a slight rise or camber (about 1 inch for each 40 feet of span), the object of which is that when loaded they shall not "sag," or deflect below horizontal lines drawn from end to end of each girder. Commonly the girder is drawn as straight and parallel, and a note made of the camber to be given. This, then, must be arranged for in setting out the work for the yard. The girder, instead of being straight, will be a segment of a ring of very large radius, and the top flange being of larger radius than the bottom, it will be longer in the same proportion. The web plates will therefore be wider at the top than at the bottom; but the deviation from a straight line of the theoretical

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edges of the web plates will not be sufficient to necessitate their being made curved in practice. The rise due to camber being given for the whole length of girder, the exact radius of the bottom flange is found from the following rule :—Divide three times the square of the length in feet by twice the rise at centre in inches, and add one-twenty-fourth of the rise. This last addition is, however, so very small compared with the rest that it may be neglected in practice. The rule will then stand thus :—To find the radius in feet of the bottom flange, divide three times the square of the length in feet by twice the rise at centre in inches. Should any fraction occur, take the next whole number above it. For example :—Let a girder be required 108 ft. long and 9 ft. deep, cambered to give a rise of $2\frac{1}{2}$ in. in the centre. One hundred and eight multiplied by itself, 108, gives its square, 11,664, which multiplied by three is equal to 34,992 ; this divided by twice $2\frac{1}{2}$—5, gives 6,998$\frac{2}{5}$, so 6,999 ft. will be taken as the radius of the bottom flange ; the radius of the top flange will be 9 ft. more, or 7,008 ft., and in the same ratio will be the bottom and top edges of the web plates. Let the web plates be 4 ft. wide at the bottom ; then by proportion, as 6,999 is to 7,008, so 4 ft. is to 4 ft. $\frac{1}{16}$ in.

(To be continued.)

OUR GUIDE TO GOOD THINGS.

44.—The "Line and Design" Series of Art Drawing Copies.

Prompted by a desire to show that a foundation in design can be laid as soon as a student can use the pencil freely, Mr. Donald W. Robertson, Head Master of the School of Art, Walsall, has produced the "Line and Design" Series of Art Drawing Copies, a well-conceived and carefully-executed collection of copies which deserve attention in all schools where drawing is taught, and from all persons whose vocation it is to teach drawing, as being eminently suggestive of the means by which drawing lessons may be made even more interesting and attractive than they are under the ordinary *régime* of instruction in this most important art. It is a desirable thing, no doubt, to reproduce, with pen or pencil on paper, any form, whether regular or irregular, that may be set before the student, but it is still more desirable for him to find the disposition of certain straight lines and points, which are at first drawn as guide marks, gradually grow, as I may say, by the addition of a few more lines, straight and curved, into a design or pattern, which is at once symmetrical and satisfactory alike to eye and mind. Mr. Robertson has been successful in producing a series of copies that will well pave the way for original design for any student who is conscientious in his work and desirous of rising above the dead level of the mere copyist. Additional interest has been lent to them by the introduction of colour in flat washes, which serve to bring out the patterns and impart to them a distinctness and individuality that no drawing in simple outline in black or white, or *vice versâ*, could ever possess. The examples in the series are intended for pupils preparing to pass the Second Grade Examination in Freehand Drawing of the Science and Art Department. Directions for drawing and colouring are appended to each example. Good designs for monograms are included in the series, whose London publishers are Messrs. Simpkin, Marshall, and Co., Stationers' Hall Court.

45.—The "Monarch" Play Chair.

Many a boy, and girl too, for the matter of that, will welcome the addition of the "Monarch" Play Chair to the furniture of the nursery. There are many combination tools in existence in which, by various adjuncts and contrivances, one thing is made to serve the purpose of many, but although I have been permitted to learn that even the hard and unyielding carpenter's bench may be converted into a comfortable if not luxurious bed, I have never yet met with a chair that was so chameleon-like in its constitution, and variable in its capacity, as the chair which is distinguished above its fellows by the proud title of "Monarch." For this capital play chair it is

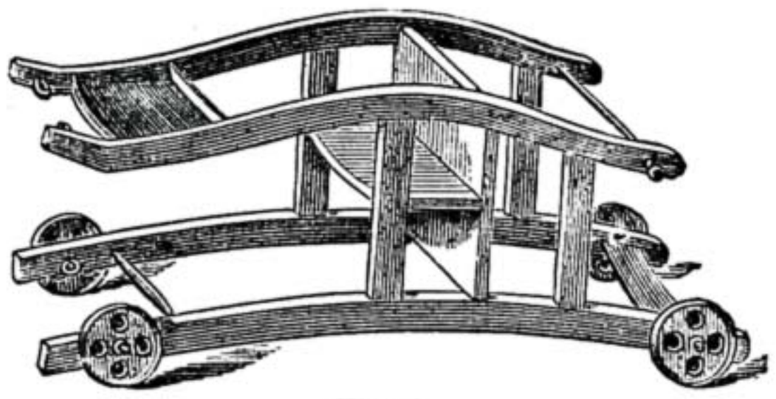


Fig. 2.

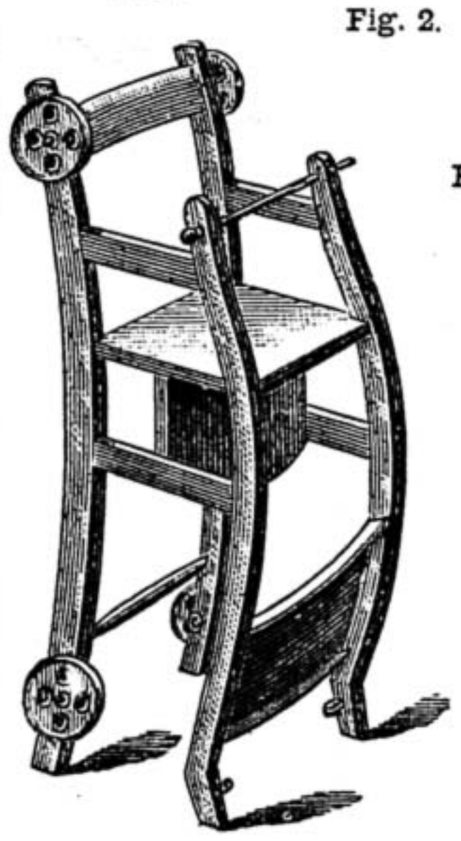


Fig. 1.

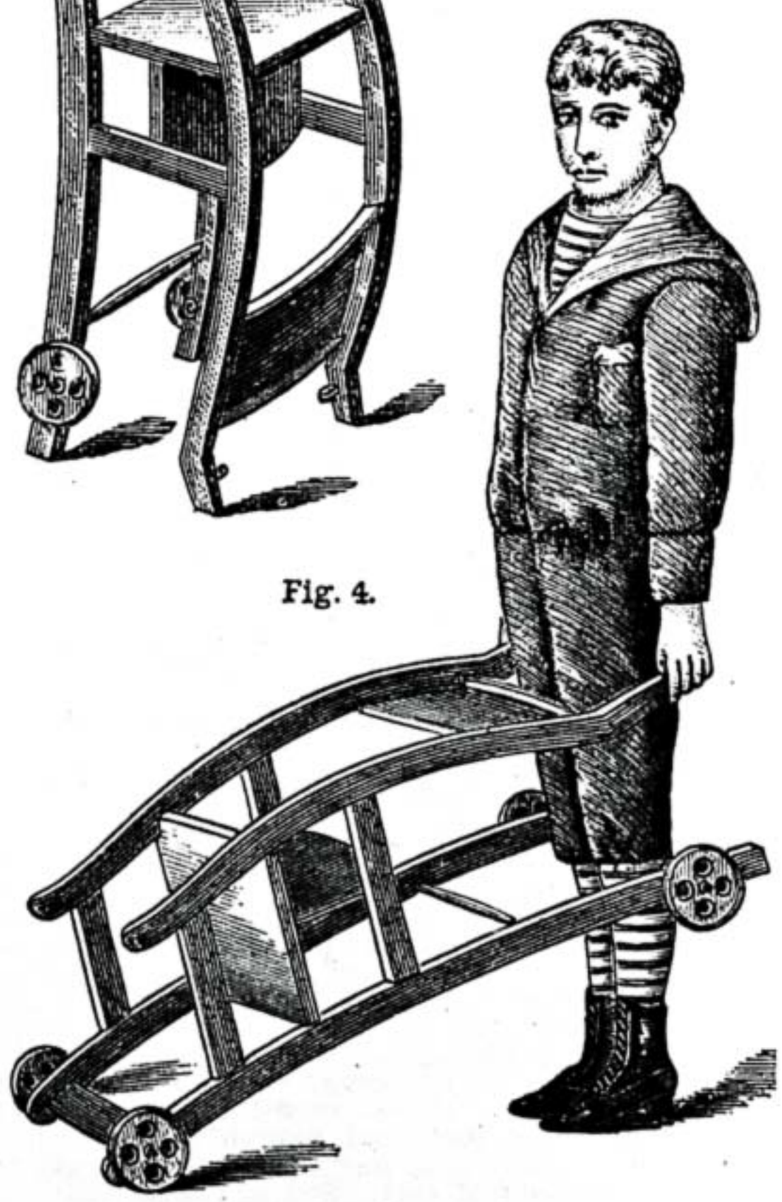


Fig. 4.

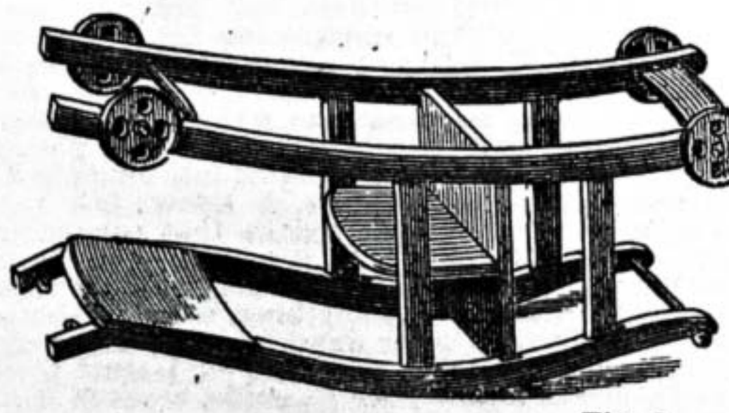


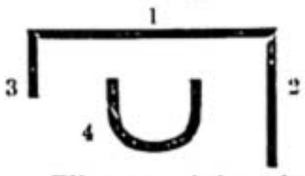
Fig. 3.

The "Monarch" Play Chair. Shown in Fig. 1 as a Table Chair ; in Fig. 2 as a Cart with Play Table ; in Fig. 3 as a Rocker or Sleigh ; and in Fig. 4 as a Wheelbarrow.

claimed by its inventor and patentee, Mr. Thomas R. Weston, 61, Hampton Park, Bristol, that it is "convertible into a cart, stool, rocker, table chair, play table, wheelbarrow, sleigh, enclosure, go cart, and, when carried by two persons, into a sedan chair, and when attached to ropes into a boat-swing." Some of its phases are shown in the accompanying illustrations, in which it appears erect in Fig. 1 as a table chair, or rather as a chair in which a child may sit at table securely pinned in by the rail or bar in front. Put it on its back, and, by the aid of the four small wheels attached thereto, this Proteus of a chair becomes a cart with a play table, as in Fig. 2, the seat of the cart being furnished by a board attached at right angles to the underside of that which serves as its seat when used as a table chair, and the play table, that part of the front which served as a rest for the child's feet when sitting in it at table. Put it on the ground once again on its front part, and it becomes a rocker or sleigh, in which a child can sit and rock itself or be rocked according to circumstances. This last transformation is shown in Fig. 3, and in Fig. 4 it appears how, by taking hold of the ends of the top to the left, as it is shown in Fig. 2, and tilting it on the wheels to the right, it may be converted into a wheelbarrow, though, I fear, the boy who is using it as such in the illustration would find difficulty in occupying it as a table chair. Among the good points of this piece of toy furniture, are its attractive appearance, its strength, its excellent finish in the best style of workmanship, the absence of any movable parts, the front rail excepted, to get out of order, to get lost, or to injure the child, and that any child can alter the arrangements at pleasure by simply turning the chair about into the various positions. The price is 15s. It may be obtained at all cabinet makers and toy warehouses. The wholesale manufacturers are Messrs. James Cox and Son, High Wycombe, Bucks.

46.—The "Era" Printer.

To use the words of its inventor and manufacturer, Mr. Fred. J. Bowditch, 5, Waldo Road, College Park, Kensal Green, London, W., the "Era" Printer "prints anything ;" and so it really does, although that "anything" must be taken *cum grano*, as meaning not everything, but any letter or figure that it may be desired to print by its aid. It is an invention which supersedes stencil plates for marking and numbering bags or boxes, and printing window tickets and brief notices, being useful, in short, for any purpose where bold lettering is essential. Thus it will be found desirable for all offices, warehouses, shops, timber and builders' yards, and all places in which lettering is sometimes required, being inexpensive to buy, always ready at hand, and practically indestructible. The means for printing are contained in a small box, and consist of a stamp, a bottle of ink, and a brush for spreading the ink on the ink pad attached to the front of the box, which falls forward on lifting the cover. It is the stamp only which requires any comment and explanation. On taking it up, it presents the appearance of a short stick of composition with a flat piece of india-rubber at one end, and a semicircular piece at the other. The end and sides of the flat piece are shaped as shown in the margin at 1, 2, and 3, imprinting three straight strokes of different lengths. The semicircular piece is of the shape shown at 4. By these forms, either used singly or in combination, any letter of the alphabet or numeral can be printed. Thus No. 1 will print I, M, N, V, W, X, each letter being formed by one, two, three, or four impressions of No. 1. Again, A, E, F, H, L, T, are formed by combinations of Nos. 1 and 3 ; K, Y, Z, of Nos. 1 and 2 ; P, B, of Nos. 1 and 4 ; R, of Nos. 1, 2, and 4 ; J, U, of Nos. 2 and 4 ; C, O, Q, G, of Nos. 3 and 4 ; S, D, of Nos. 1, 3, and 4. Of the numerals, 1 and 2 are formed by combinations of Nos. 1, 2, and 4 ; 3, of Nos. 3 and 4 ; 4, by No. 1 alone ; 5, of Nos. 2 and 4 ; 6, by No. 4 only ; 7, by Nos. 1 and 2 ; 8 and 9, by No. 4 only ; and 0, by Nos. 3 and 4. I think sufficient has been said to show the ingenuity and utility of the invention, and that it is applicable for all lettering for which stencil plates are now used, although the results may not be so neat and regular as the impressions by means of plate and brush. The stamps are made in different sizes to suit different purposes, and range from about $\frac{1}{2}$ in. to 2 in., as regards size of letters. The set for stamping 1-in. letters is supplied by the inventor, post free, for 1s. 3d.



The Editor.

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SHOP:

A CORNER FOR THOSE WHO WANT TO TALK IT.

*** *All Communications will be acknowledged, but Answers cannot be given to questions which do not bear on subjects that fairly come within the scope of the Magazine.*

I.—LETTERS FROM CORRESPONDENTS.

What a Glasgow Man Thinks of WORK.—W. C. T. (*Glasgow*) writes:—"I am very glad that (as the *Glasgow Herald* says) you have made a hit with WORK. It deserves to be a success. It was just needed by fellows who job at home like myself. I think that if you have loose covers on the weekly numbers they would help to keep them clean, for the WORK weeklies get dirty on the outside with our dirty hands, being black squadders, and that does not look well in a bound volume. The covers could be made to pay by advertisements."—[I am obliged to you for your letter, and the notice of the patent darning weaver. Your suggestion with regard to wrappers for the weekly numbers is a good one; but it would not prevent the pages from being soiled by turning them over while reading. To keep the outside fairly clean, make a loose cover of pasteboard as recommended in "Binding Made Easy," Nos. 6 and 9, and put four or five strings along the back, inside from top to bottom, to take as many weekly numbers.—ED.]

Cabinet in Fretwork.—BUHL writes:—"I have been waiting to see if there were any among your readers of WORK that had undertaken the making of the inlaid cabinet; and, if so, to read what their experience was, because it is an almost impossible pattern for 'amateurs;' a professional would not think of executing it, being too much labour for little effect. A 'marqueterie cutter's' mode of operation would be to trace the pattern given upon strong tracing paper, then perforating it with a fine needle, from which he pounces several patterns. He then takes his ground woods—say four (it is generally four they cut)—and gums a pattern on one of them, and then four coloured veneers, of whatever colour the ornament is to be, and gums his ornaments on to one of them; a piece of greasy paper will be put between the first and second veneers of each packet, and then pinned up separate. He will now make a saw, then start cutting his ornaments, laying them out in a tray as he does so; having cut the ornament, he proceeds to cut the grounds. Having done that, and having no shading to do among the ornaments, he will put them together, when they will fit as near as possible to air-tight. Now fancy an 'amateur' following the instructions of the 'designer' in a pattern like that, by using a shop saw, and cutting 'buhl,' or one into the other, fashion; he would either break all his groundworks, or lose his ornaments in space; in the one you would have no saw kerf, in the other you get hardly anything else. I could not resist writing on the above subject, as it is a line in which I have been engaged for some considerable time, in all its branches—the 'cutting,' 'engraving,' and 'designing,' in the principal 'London' West-end firms. Accept my best wishes for WORK."—[I am pleased to have your letter, as it gives evidence of the interest taken by men of every trade in WORK, and of their readiness to assist by instruction, reproof, caution, etc.—all of which we ask for and desire. You will learn from other letters on this subject that amateurs have managed the work, and got through the cutting of the design, although it is certainly elaborate, as you say. Will you send me some of your own designs to look at? for, in the case of WORK, it is always a selection, and, therefore, a survival, of the fittest; and if your designs surpass those of the "designer" of the "Cabinet in Fret Cutting," both he and I would be glad to find you numbered among the contributors to WORK.—ED.]

A Good Word for WORK.—J. L. (*Elgin*) writes:—"I have taken WORK since its commencement, and am much pleased with it; and having the 'Technical Educator' complete, I should be fairly well instructed by it. You will, no doubt, receive so many advices and hints how to conduct the 'paper,' as, if followed, would only leave you as a machine to be moved at will, and I have no intention of adding an infliction in this way. Everything can't appear at once, as we impatient patrons would like; and, while adding my congratulations on such a good start, would merely suggest that thoroughly reliable papers on such subjects as forging, brazing, and soldering, would interest not a few. How few can practically treat the various grades of steel when such a thing as welding is necessary? and being practical myself, know the value of such information."—[Thank you for your good wishes. I do indeed receive much advice, and many hints. Well, I read all, and I am truly thankful for the kindly endeavours that are made to lead me in the path in which each individual writer thinks I ought to go, but I pursue the even tenor of my way, imagining, vainly enough, perhaps, that I know my own business best. There was a man once who called his wife an *obstinata mulier*, putting something else before *obstinata*, which I omit for propriety's sake. He only meant, poor fellow! to say that she was an obstinate woman, which, possibly, she was, and he relieved his feelings in Latin, trusting that his little outburst would thus escape notice. The woman kicked, however, and said she wasn't going to be called an obstinate mule by any man living, and certainly not by her husband. It may save much trouble if I allow at once that I am a very obstinate mule myself, but that I do not in the least mind being called so, with any word by way of prefix that may be preferred.—ED.]

Hints to Amateurs.—M. A. writes:—"Being interested in amateur work, especially what I deem the most useful branch—viz., carpentry, joinery, etc.—I hail with satisfaction the appearance of your journal. The hints to amateurs in a recent number were very good, but in my opinion just left off where they should have continued. The great difficulty with all amateurs is not how to mix glue, to saw a straight line, etc., but to make a good joint; and this, I think, is a point that should be thoroughly set out in your journal, together with the explanation and diagrams illustrative of the various kinds of joints, and the explanation of the technical terms used, etc. etc. Such matters are easily enough learned in the workshop, but it is only the very few who can obtain such help; and, moreover, as they are unwilling or unable to invest in expensive books, they look to obtain the information in your valuable journal."—[In reply to your remarks on this subject, first let me say that I am in complete accord with you in considering carpentry and joinery as one of the most useful branches of manual labour to which an amateur workman can turn his hand. Gluing-up and ability to make a straight saw cut are matters which require practice, I can assure you, and it is as necessary to give instructions on such points as these as on other things mentioned in your letter. If you can make and use glue in a proper way yourself, and can rip down a board from end to end, holding the saw so truly that the saw cut is straight throughout, and the edges thereof at right angles to the surface of the board, you are well advanced on the road to excellence as a carpenter. Let me ask you, when you are sawing through a plank lengthways, and wish to do the work as truly as possible, how you test your progress and ascertain that you are not bearing on the saw so as to drive it out of a truly vertical plane (supposing the board to be truly horizontal) either one way or the other. It is a very simple matter, and, doubtless, you know all about it, but—if you do not, you will agree with me that it is even desirable to show, as you put it, "how to saw a straight line." Well, as to "jointing boards," papers on this very important branch of carpentry are already in the printer's hands, and are being translated—if I may use the expression—into type. With regard to the explanation of technical terms, whenever any term that may not be perfectly intelligible—as, for example, "bolection" moulding—is used, the meaning will be given; but it is possible that there may be many omissions in this respect, for the simple reason that writers who are thoroughly conversant with the subject often forget that those for whom they are writing are not so well informed on minor points and technical terms as themselves. But when any term is used that is not readily understood, a few lines pointing out the difficulty will always meet a ready response in "Shop," which will tend at once to dissipate any cloud of mystery that may appear to hang about it. —ED.]

A Vote of Thanks.—S. D. writes:—"If Mr. Adamson would derive any pleasure from the knowledge of the fact that he has been the means of encouraging some youthful amateur to push his endeavours to a successful end, I consider, out of common gratitude and justice, he deserves to have that satisfaction. From his design I have made an overmantel; but instead of using waste timber, such as packing cases and the like, or even tea chests, I have gone to considerable expense in buying the best white pine and mahogany. It is, in my estimation, false economy to utilise that timber for such purposes. The damage done to planes and utensils and the increased amount of labour necessary quite neutralise any advantage that might be gained in the first cost. But of course that is a matter for individual consideration. Mr. Adamson was very successful in introducing his design to the readers of WORK in an attractive form, and I beg most heartily and sincerely to thank him for being the cause of my possessing a really handsome piece of home-made furniture."—[You will notice that your letter has been translated into long hand. Shorthand has its advantages, I know; but my education was sadly neglected in that particular branch, and your letter, as it was, was thrown away upon me. However, I can generally manage to get on the other side of anything, whether shorthand or trade secrets, or anything else that may happen to be somewhat cloudy. But I trust that no one else will follow your example, because if it is done to any extent, I shall have to provide myself with a special shorthand clerk, which will be to me an expensive luxury.—ED.]

About WORK.—D. T. D. (*Cardiff*) writes:—"I desire to supplement what so many of your readers have already said as to the value and worth of your able production, WORK. I need not say how useful I find it in my recreative moments. Being engaged all day with a great deal of arduous brain work, you can understand my appreciation of amateur's work, therefore my high appreciation of the articles in your able edited publication. I wish your every effort every possible success. There is one thing I should like to suggest if you will allow me, and that is, that a wrapper be put around WORK, in order that the advertisements may not be bound up with the readable matter. Doubtless that has already engaged your attention, and I have no doubt that your enterprising firm will, when the publication is better known, accede to the wishes of your readers in this direction."

Asking for More.—T. J. H. (*Trowbridge*) writes:—"For many years past I have taken in all of your publications that have come within reach of the average workman's pocket, but the most tantalising is your latest, WORK. Why, it's like feeding a lot of donkeys with one oat at a time, and making each donkey wait for his turn to get the oat. Could you not double or treble the thickness (I would not increase the size of the pages) of WORK, and charge us 2d. or 3d. for it, and so enable yourselves to give us a few articles on other subjects? I am sure the readers of WORK would not object to double the information (for a start) at 2d., at the same time putting an end to the 'crowding out.' Alas! if you had to buy instead of sell WORK you would not object to its being issued in a spare or advertisement cover. If you lived (as I do) in a country town, and saw your favourite WORK, with other papers, thrown out of a train (like a lot of fish guts at Billingsgate) into the dirt on the railway platform, well, perhaps you would not swear, but you might think some very strong words that will not appear in your 'Encyclopædic Dictionary.' I should like to see the opinions of fellow readers of our WORK on these points."

Tea-Chest Wood.—G. W. M. (*Westbourne Park*) writes:—"Both BARRINGTON and yourself are right with regard to old tea chests. Being in the grocery trade I am always on the look out for anything useful in the way of old boxes. The tea chests sent over by the Chinese are almost useless for anything but firewood, but those sent over with Assam, Ceylon, and Indian teas, can often be put to good purpose. Assam, and sometimes Indian, tea chests are made of teak, the boards being from ½ in. to ⅝ in. thick, and from 6 in. to 9 in. wide. The Ceylon chests are made of a rather soft reddish wood, not unlike Spanish mahogany when the grain is good, but much lighter, the boards sometimes being as much as 12 in. and 14 in. wide. Another useful box is the American bacon box. These boxes are made to hold five sides of bacon, being made of inch pine about 3½ ft. long by 2 ft. 6 in. deep, and 1 ft. 6 in. wide. The boards used vary in width; from two to four are used for the sides, but the tops and bottoms are usually in one piece. They can be obtained at most wholesale cheesemongers at from 1s. to 1s. 6d. each."—[I have used the American bacon boxes with good effect for fencing and ornamental work in the form of plant boxes, for what I term "wall gardening." The boxes in which honey, lobsters, Swiss milk, etc., are sent to this country, I have often utilised as plant protectors, converting them into small frames by cutting sides and front to the proper slope, and then making a light to cover the top. It is surprising to find how much can be done with boxes that are generally considered as being fit only for firewood. —ED.]

About WORK.—J. P. A. writes:—"After reading a prospectus setting forth the great amount of information and practical instruction to be got out of WORK, I immediately ordered it. But I was greatly disappointed, for I find it almost useless to practical men, although it may be otherwise with clerks and such like, who want to put off their time by a little wood spoiling or something else. But I am a practical cabinet maker and joiner with my bread to earn, which is as much as I can do, without wasting my time making such useless trifles as you give such full instructions about. But to be more particular. You take up a great deal of valuable space (I say valuable not because it is valuable, but because I think it might be made so) in giving instructions about making such things as iron trying planes; but where is the man who having need hasn't got one? or if he hasn't he can buy one a great deal cheaper than he could make one, or he could make one without any need for instructions. Another large space wasted is that on hinges, and how to fix them. How can you take up space with such trifles when you say you have so much waiting? In your 'Guide to Good Things' you only describe the stock of two firms, and then only unimportant things, or if important, things which working men know just as well as yourselves. Very few would want such a thing as a Lukin lathe. The last number is now in my hand, and in it one of the designs for a lattice-work blind is very bad—in fact it could hardly be made as shown. In your 'Guide to Good Things' you describe a circular saw which you say will cut 4-in. stuff. Well, I have seen a good many treadle saws, but I have only seen one that has been worked at all after the first week or two; the rest have invariably been thrown on one side. This is one made by the master (my father), which we have had *in constant use* for about two years, and it is more used now than ever it was. Don't think I am prejudiced because you may think I had a hand in making it. I would describe it, as it is made on an entirely new principle; it has never got out of order, although it has only been made of odds and ends, only the saws being bought, all the other parts have been made out of whatever was handiest; but the inventor is seriously thinking of patenting it. Some day you may perhaps find room for an illustration in your 'Guide to Good Things,' as it has nothing in common with any I have yet seen. Of course it is easier to find faults than to mend them, but by way of suggestion I think it would be better if you followed rather more in the steps, or rather in advance, of the 'Technical Educator,' with a few such papers as Dr. Dresser's 'Principles of Design,' or Prof. Church on 'Colour,' or 'Building Construction,' or such papers as 'Electricity' in Dr. Lardner's

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'Cyclopædia,' or other papers in the same series, and gave a few good drawings for *carving* or illustrations of *good old or new furniture* or good inventions, with a few papers on such a thing as handrailing. You talk of a practical man taking pupils for a short time; a short time will do the pupils little good, and certainly will do the rest of your readers much less. I have Jeay's book on handrailing before me. I think this makes it simple enough, but the majority of joiners will not consult a book, whereas they will often follow the instruction of a journal. The 'Cabinet Maker and Art Furnisher,' though cheaper, has much more information than WORK. I hope you will accept this criticism in the spirit it is written, and if you cannot altogether make such sweeping changes, at least do what you can, or else before long you won't be able to number a practical man in your subscribers. P.S.—I can supply your correspondent with as many Elizabethan twists as he likes, finished, direct from the lathe."—[Your strictures are sufficiently answered by other letters in this number without any rejoinder on my part.—ED.]

About WORK.—H. C. F. (*Great Bedwyn*) writes:—"I must take this opportunity of telling you how pleased I am with WORK; it is a paper which has been much wanted, and to such as me (a country joiner) will prove a great boon, as the classes in towns are beyond my reach. I have already the pleasure of supplying three monthly parts, and each of these customers speak very highly and hopefully of this practical and useful publication."

Plans and Specifications of Buildings.—AJAX (*Huddersfield*) writes:—"In reference to the introduction of *plans, specifications*, etc., into your much valued WORK, I think myself, *coupled* with the opinions of fellow subscribers, that it would be of decided interest, and the means of a large circulation, and would not fail to please all generally."

How WORK is appreciated.—H. G. writes:—"I am very pleased to tell you that I shall have each volume of WORK bound, because I know it will be the means of assisting my children in gaining a technical education. Success to yourself and WORK."

Lacquering.—FAL writes:—"Some of the readers of WORK who go in for repoussé work may be glad to know that the silico enamel sold by all dealers in cycling requisites is a first-rate thing for superseding lacquer. It flows as ready as water over the brass plate, and as no heat is required all the difficulty which the use of lacquer involves is avoided."

Muzzle for Ferrets.—FAL writes:—"The plan described by OPIFEX is good, but it has the disadvantage of requiring a separate muzzle for each ferret, as their heads differ a good deal in size. The ferret, also, will be apt to hurt his jaws if he works too energetically, as the projecting pin will catch against the sides of the top when he and the rabbit are at close quarters; this, of course, has a tendency to make him slack. The best plan I ever met with for 'coping' ferrets was taught me by a warrener in Warwickshire, many long years ago. I used it for twenty years on a large manor, where we killed from 1,000 to 1,500 couple annually, and found the ferrets would work quite as well 'coped' as they did when free. All that is required is a piece of tape and a little soft twine. The tape should be tied round the ferret's neck, so as to form a collar, and should be kept on permanently. When required for work make a single knot in the centre of a piece of twine, but do not have it taut. Open the ferret's mouth by pressing the sides of the jaws, and then slip the loop of the knot over the canine teeth in the lower jaw, and draw the knot close; bring the two ends over the nose, and make a double knot, slip one end of the twine through the collar, and knot both ends together. It requires a little practice to get the right tension in the knots; if they are too taut the twine will hurt the ferret, if too slack he will get his claws in the twine, and pull it off. I can cope a ferret by this method in less than half the time it has taken me to describe how to do it."

Bookshelves.—SCOTO-IRISH writes:—"I have just been turning over the pages of your interesting paper, which I hailed with delight when the first number was published. The subjects treated, so far, don't give me a chance to exercise my spare moments upon, as they are rather intricate for me, or require tools that I don't possess; but I live in hope that ere long my patience will be rewarded by seeing some article that will specially interest me. What I should particularly desire to see described in your journal is an article on how to construct a plain, substantial bookcase, free from turning or fretwork, but which might be made with the aid of a saw, plane, and chisel. I am sure I don't stand alone in my desires. I had a request from a friend in Scotland if I could furnish him with a design for same. I purpose making a start shortly to try and make a case to hold my books, but if I get any encouragement from you I will hold it over until such times as an article may appear, that may go beyond the appearance of a *packing case or box* in its construction."—[A paper entitled "Some Rational Bookshelves" will shortly appear, which, I think, will please you and meet your requirements in every way. Certainly no pains will be spared to render both the text and the diagrams so explanatory that any one able to handle a tool need not long be without a useful bookshelf.—ED.]

II.—QUESTIONS ANSWERED BY EDITOR AND STAFF.

Photographic Apparatus.—W. W. (*Devonport*).—Articles will appear in WORK describing the construction and use of cameras and all kinds of photographic apparatus, with such details as you ask for.—T. C. H.

Half-Plate Camera.—J. R. (*Hebden Bridge*).—See answer to W. W. (*Devonport*) above.

Adjustable Callipers.—E. B. (*Manchester*).—As you say you "have tried most tool shops in Manchester and failed to get" these useful appliances, you had better send to Messrs. R. Melhuish & Sons, 85 and 87, Fetter Lane, London, E.C., who have them on sale.

Wood Carving and Carving Tools.—P. P.—You give your name only, and no address, so I am unable to write to you on the subject of your letter, as I should have done. If you will send me a set of your tools and accompaniments, with specimens of carved work and instructions supplied to your customers, I shall be better able to judge of their utility. If they are up to the mark, I will notice them in "Our Guide to Good Things." When next you write to me on this subject do not omit your address. Every one who writes, under his or her own name, should give address, not for publication, but to enable me to communicate with them direct, if there be any necessity for it, as in your case.

Hatchet.—J. P. (*Gt. Keyne*).—To make a hatchet, procure a piece of flat iron of the best Staffordshire quality—say, Lord Ward's—and file it down to the shape in Fig. 1. If the head has to be steel-faced,

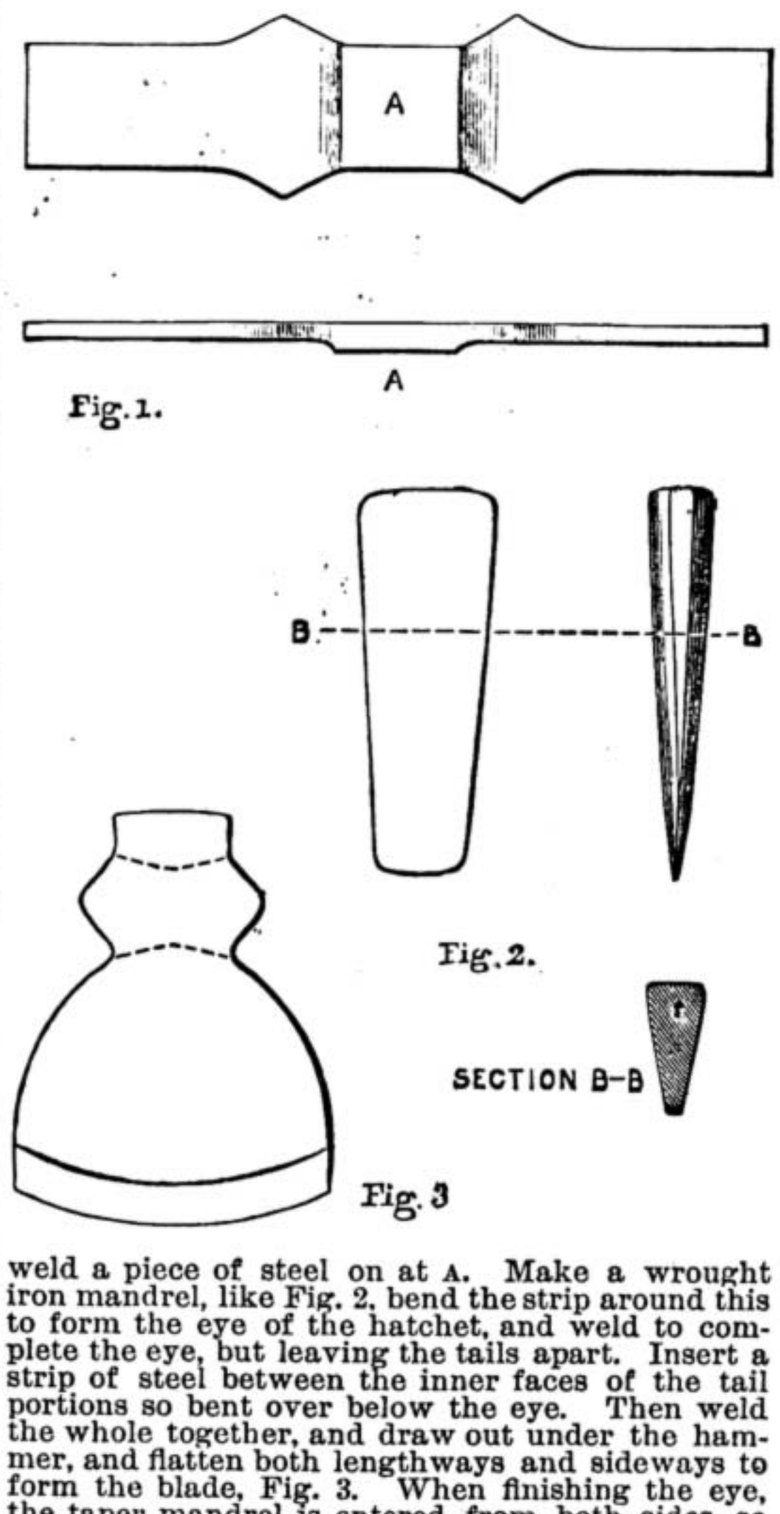

Fig. 1.

Fig. 2.

Fig. 3

weld a piece of steel on at A. Make a wrought iron mandrel, like Fig. 2, bend the strip around this to form the eye of the hatchet, and weld to complete the eye, but leaving the tails apart. Insert a strip of steel between the inner faces of the tail portions so bent over below the eye. Then weld the whole together, and draw out under the hammer, and flatten both lengthways and sideways to form the blade, Fig. 3. When finishing the eye, the taper mandrel is entered from both sides, so that the eye is smaller in the centre than at the outsides. This is necessary in order to prevent it from slipping off the handle after wedging. Shear steel, or double shear steel, should be used for the edge. To temper, heat the hatchet to a low red, and partly quench in water. Then take out and allow the heat to go back to a light purple, or plum colour; then quench until entirely cold. Leave the forged edge a fair thickness for grinding away.

Cost of Patent.—P. T. S. (*Sheffield*).—The statement referred to was a clerical error. The Government stamp of £1 on depositing the provisional specification secures protection for nine months. If you intend to proceed with the application you must within that period deposit a final specification, the stamp in this case being £3, and the papers obtainable, the same as for the provisional specification, on application. Two months are then allowed to elapse to afford opportunity to any desiring to oppose the sealing of the patent. After that period you can obtain the sealed patent on application. Until the patent is actually sealed you should observe secrecy in regard to your invention.—F. C.

Weight of Fly Wheel.—F. W. M. (*North Brixton*).—There is a great deal involved in such a question as this. There are several rules based upon cases in practice; but since conditions vary, the rules are not applicable to all cases. Perhaps the best is one of Molesworth's:—

$$W=\frac{\cdot6366\ P\ S\ C}{D}\left(\frac{N}{60}\right)$$

where P=pressure on piston, in tons; S=stroke of engine, in feet; D=mean diameter of rim, in feet; N=number of revolutions per minute; C=constant, varying from 3 to 4 in ordinary engines, and rising to 6 when great uniformity is required; and W=weight of fly-wheel rim, in tons.

Another rule, which does not take account of piston speed, is

$$W=\frac{P\ S}{45\ D}$$

where W=weight of rim, in cwts.; D=mean diameter of rim, in feet; P=total average pressure on piston, in lbs.; and S=stroke, in feet.

The principle, however, is as follows:—An engine would, in the absence of the fly-wheel, run at varying velocities at each single stroke, due to the ever varying nature of the forces operating on the crank pin. The governor regulates the admission of steam to the cylinder, and so determines the *mean* speed at which the engine is to run. But the fly wheel regulates its degree of *steadiness* under the continual fluctuations of velocity to which it is subjected. In marine engines with cranks at right angles, the motion of the paddle wheels, or of the screw and its shaft, tends to equalise the motion of the engines. In locomotives the weight of the engine has the same effect. In hand engines the fly wheel is necessary to absorb energy when that is in excess, while it gives out some of this store of accumulated energy again when the power of the engine diminishes, and thus maintains equable motion. The fly wheel is in effect a falling body—that is, its accumulated energy is correctly calculated as though it were a body falling perpendicularly and gathering energy as the square of its velocity. The weight of the rim alone is taken account of. Knowing piston area, speed, and steam pressure, it is easy to calculate the amount of power given out by the engine at every stroke. It is necessary, however, to assume some arbitrary relationship between the stored-up energy in the fly wheel and the power of a single stroke. It must be more than that given out in a single stroke, but the precise relationship will have to be settled by existing conditions. A slow running engine will require a greater reserve of energy than a fast running one. Engines badly balanced require a heavier wheel than those whose balancing is perfect. Some machinery is thrown into and out of action more frequently than other kinds, thus subjecting the engine to extremes of stress. A variation of speed permissible in some machinery would be injurious to the motion of others. Usually the reserve of energy of the fly wheel is estimated as being equal to that given out in six single strokes of the engine—that is, equal to area of piston × pressure per square inch × 4 to 6 single strokes, the result being in foot-pounds. A mean diameter is assumed for the fly wheel as most convenient—say, length of stroke × 3 or 4. From the number of revolutions of the engine per minute the velocity of the fly-wheel rim of a given diameter can be calculated in feet per second. Having found this velocity, the height from which a body must fall by gravity to acquire such velocity is estimated. The energy in foot-pounds of the number of single strokes first taken or assumed is then divided by this height, and the quotient is the weight in pounds which the rim of the fly wheel must have in order to possess a quantity of energy equal to 6 single strokes of the piston. By this method, a cylinder 6 in. in diameter, 10 in. stroke, with 40lbs. of steam, would, assuming 6 strokes, work out thus:—

6 in.^{2} × ·7854 × 40 × 6 = 6768 foot-pounds.

Assuming 200 revolutions per minute, and fly wheel 3 ft. 4 in. mean diameter, then—

3 ft. 4 in. × 3·1416 × 200 = 2094 feet per minute, or 34·9 feet per second.

To find the height from which a body must fall to acquire this velocity, square the velocity in feet per second and divide by 64·4 = 18·9 feet. The energy given out by 6 single strokes divided by this is the weight of the fly-wheel rim in pounds, thus:—

$$\frac{6768}{18\cdot9}=358\text{ lbs.}$$

This weight may be disposed in any sectional form about the mean radius of the rim.—F. C.

Violin Tools.—J. W. (*Battersea*).—I am not acquainted with a tool bearing the name you give ("fillitere"), nor do I see the use of it. Veneers may be reduced to any desired thickness with a five-toothed veneer plane. If you are desirous to make purfling—which may be bought very cheaply—you might do as follows:—Cut two strips of dyed veneer and one strip of white two inches wide; glue the white piece and one black piece together; when set, plane the white side to the thickness you want, and then glue on the other black piece. These being dry, the sheet should be planed, so that both blacks are the same thickness; and the whole sheet is $\frac{1}{16}$ in. thick. Plane one edge true, on the shooting board, and with a sharp knife and steel straightedge divide into strips of $\frac{1}{16}$ of an inch. Please specify the particular tools you require.—B-

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Wooden Copying Press.—You ask me to "minutely describe how to make the wooden screw and threaded block through which the screw revolves" for the wooden copying press described in WORK No. 2 (p. 27). The screw is first turned in a lathe, and then cut with a box and tap; and to describe the process as you ask would be practically useless to you. Mr. Denning tells you that in making his press he used "a discarded bench screw." I recommend you to do the same; but if you do not happen to have one, and cannot get one elsewhere, go to any dealer in tools, and buy a wooden bench screw. It will cost you about 1s. 6d. or 2s.

Papier-Mâché Pulp.—W. H. (*Dover*).—Without fuller information it is not easy to say why W. H. should have failed to make his pulp set properly. Possibly he may not have used enough pressure to expel superfluous moisture, or his paper may have contained saccharine matter, or his paste may have been too thin, or the flour used may have been what is called "self-raising." The glue paste is made by boiling flour and glue with water, and this has, after boiling, to be most thoroughly and intimately mixed with the pulp. A subsequent boiling might make the incorporation more complete, but would otherwise be immaterial. The mixture must be a thick mass before any attempt is made to mould it. In modelling in pulp (*i.e.*, building up forms in it with the spatula), only a little should be added in a day, and then dried. For trade purposes, considerable heat (stoving) is used in drying. A mixture of pulp with the above-described paste, when properly freed from moisture, can scarcely help setting into a solid mass. Glue alone would serve, as in the composition for stopping holes in wood; but when used on a large scale would be liable to crack, which the paste is not.—S. W.

Casting from Life.—J. E. S. (*Stoke Newington*).—Casting a hand or foot is simple when one side only has to be moulded. Take the hand; the back only to be shown. Rub a very little olive oil over the skin, place it palm downwards on a cloth so arranged as to fill up the hollows beneath as far as possible, and pour on the plaster. When this is set (say, in five minutes), the cloth may be pulled away, and the mould eased with a knife where necessary to let the fingers be drawn out. Well rinse the mould with clean water, and it is ready for making the cast, either in plaster or wax. If both back and palm are to be moulded, bury half of the hand in sand, mould it, turn it, and clean sand from edges of mould, which brush over with clay and water to prevent the two pieces of the mould adhering. Make second half of mould, remove the hand, and tie the two pieces tightly together before filling. To the second query of J. E. S. we would reply that articles, with illustrations, fully explaining the whole art and mystery of plaster-casting, are in preparation, and will soon appear in WORK.—M. M.

Lathe for Wood Turning.—F. S. (*Crewe*).—In reply to your queries:—(1) A conical mandrel fitting is best for wood turning, because the friction is less than parallel fittings. (2) No advantage whatever, unless you have corresponding block to raise the headstock. (3) This is a grave question on a common lathe; it is essential first to have front of headstock planed square with bed or bearer; then to have a casting (brass will do) to form base-ring for adjustment of oval. The cost of a trustworthy chuck to produce ovals of from 1 in. to 12 in. would be more than the value of an ordinary wood-turner's lathe. F. S. should try his hand at plain turning. First reach the first rung of the ladder before mounting the top.—G. E.

Overhead Motions.—J. E. J. (*Portsmouth*) writes:—"Referring to the valuable articles now appearing in WORK concerning lathes and turning appliances, and more particularly the portion dealing with 'Overhead Motions,' will you kindly point out the objections to the accompanying arrangement which I propose adopting, and which appears much simpler and easier to make than any shown in your last number? I ask your advice on this subject as your contributor recommends amateurs to be cautious in adopting ideas of their own in preference to those generally approved by our best makers."—From a practical point of view there is scarcely any objection to the form of overhead which you have sketched. As a cheap rig-up it is a very good substitute for the more expensive, and only slightly more efficient, pieces of apparatus shown in p. 92 of WORK, and with a few very slight modifications in design it will answer your purposes as well as those. First, for the wooden supports which you show at the left-hand end of the lathe-bed I think I should substitute iron—either parallel rectangular bars, between which the horizontal bar for the guide pulleys would be pivoted; or a single stout bar forked at the upper end to embrace the horizontal one, similarly pivoted. Then, instead of fastening these bars to the top of the lathe-bed, I would bring them down past the end and attach them to the standard. It is not clear how you intend to adjust the pulleys to suit the position of slide rest, as the centres of the pulleys in your sketch correspond with the longitudinal axis of the horizontal bar. I would suggest making a light casting to slide along the bar, to be pinched in any position with a set screw. From an eye in the bottom end of this casting I would suspend the guide pulleys by means of cord, so that they should be free to revolve on their spindles, and to turn into any required position to suit the drill spindle in the slide rest. This would be better than having the pulley spindles rigidly fixed in the horizontal bar. With these slight modifications your overhead will prove a good and efficient one.—J. H.

Bronze Powder and Frames.—G. A. (*Sheffield*).—Fig. 17 is described in second column of p. 74. The bronze powder at 6d. an ounce is hardly likely to last. Hughes and Kimber, of Fetter Lane, E.C., keep many qualities at various prices. I confess I do not quite understand your query. You say "Fig. 1 is mentioned as making a beautiful panel, but no mention is made of any frame; the same of Fig. 17." The latter I have referred to above, and the former is described on p. 72.—J. G.-W.

Printing Machine.—H. C. F. (*Great Bedwyn*).—The wooden copying press described in WORK No. 2 (p. 27) would not do for a hand printing press, in which the impression should be given by the action of a lever. Your letter shows that you are very much in the dark with regard to everything relating to printing, especially when you say that among your difficulties are, "how to fix the type, and how to use it when fixed." To attempt to give you the necessary instructions through "Shop" would be useless. You shall be shown how to make a small press, and do a little elementary work in printing, in some papers devoted to a consideration of the subject by a practical printer who is also a good woodworker.

III.—QUESTIONS SUBMITTED TO CORRESPONDENTS.

Etching Names on Cutlery.—J. W. C. (*Walkley*) writes:—"Can you, or any correspondent, please tell me how to do it; or can you give me the name of a book that will give full instructions? I am told I shall want a small copperplate printing press, and I have to print the name I want to etch on a small slip of paper with a special kind of ink, and then use some transferring process. I should be very thankful to get full particulars of etching, as it is very much used in Sheffield trades."

Composition for Covering Pipes.—R. A. P. (*London*) says, "I should feel much obliged if a reader could give me a recipe for a composition for covering pipes to keep them from frost."

Machine for Current of Air.—BELLOWS (*Gloucester*) asks, "How a machine, to answer the purpose of an ordinary household bellows, should be constructed in order that it may be worked by a rotary motion, and give a constant current of air instead of an intermittent one."

Cleaning Oil Paintings.—L. S. (*Lower Broughton*) writes:—"I have an oil painting which has got very dirty, and should be glad if some one will inform me, through 'Shop,' how I could effectively clean it without injuring the figure."

Organ-Builders' Tools.—W. P. (*Grantham*) says:—"I want you to tell me where I can get the best list of piano and organ builders' tools, as I want several. I have got Mr. Melhuish's list, and I find tools for every trade marked, but none mentioned for the above, being an organ builder."

Chuck for Frame Turning.—R. C. H. asks:—"Would any reader of your valuable paper enlighten me on the subject of an eccentric chuck for turning oval frames and handles, and favour with drawing of same; or state where such can be obtained, and also what is the price?"

Joints in Indiarubber.—W. P. (*Grangetown*) writes:—"Will any kind reader tell me how the joints in bicycle tyres are made, also how to vulcanise indiarubber?"

A Pronged Ring.—BATTLEMORE writes:—"I want a malleable cast-iron ring with three prongs 1 in. diameter and $\frac{3}{32}$ in. thick. I might require them made in quantities of thousands. Can any reader give me the name of a good firm who could make them at a reasonable price?"

Moulded Indiarubber.—OSLEK writes:—"I want a piece of circular-moulded indiarubber 1 in. diameter and $\frac{5}{32}$ in. thick. Could any correspondent tell me where I could get them manufactured at a reasonable rate?"

Facsimile by Electro Process.—ELECTROTYPE asks, "How may I obtain a facsimile of a letter in relief for letterpress printing by the electro process?"

IV.—QUESTIONS ANSWERED BY CORRESPONDENTS.

Etching on Steel.—P. J. E. (*Hackney*) writes in reply to EXCELSIOR (see page 125):—"Seeing that you want to know how to etch on steel, I beg to submit the following receipt:—First clean your steel, and then dip it into hot white wax; then let it stand till it is hard, then dig again, and let it stand till hard as before; then take a needle, or anything with a sharp point, and draw your subject on the wax. After this use the following solution:—Pyroligneous acid, 5 parts; alcohol, 1 part; nitric acid, 1 part. Mix the first two, then add the nitric acid, pouring the preparation over the plates where the traces of the picture are. Let it stand till it has eaten sufficient depth, then wash the plate in cold water, dry it, and place it near a fire till all the wax is melted off."

Model Beam Engine.—ELECTRO writes in reply to W. J. P. (see page 125):—"I am at present making a model beam engine 1½-in. bore, 2-in. stroke, and got a very good sectional drawing of the engine, full size, from Mr. R. Thompson, engineer, Church, near Accrington, and also the whole of the metal, and brass castings of same, at a very reasonable price."

Trade Notes and Memoranda.

A FOUNTAIN, fourteen yards in diameter and eleven yards high, ornaments the base of the Eiffel Tower. At the top are eleven figures. Six of them form a central group; and five lower down represent Europe, Asia, Africa, America, and Australia.

THE plant employed on the works of the Manchester Ship Canal is now worth more than three-fifths of a million sterling. By about the end of June there will be 20,000 men employed. Nearly one-third of the total excavation (reckoned at 47,000,000 cubic yards) has been finished.

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AT last it is probable that a monument will be erected to the memory of William Symington, whose remains have laid in the churchyard of St. Botolph, Aldgate, since 1831, with no memorial to mark the spot. His steamer, the *Charlotte Dundas*, was held in the Forth and Clyde Canal in March, 1803, and to him undoubtedly belongs the honour of being the pioneer of steamship propulsion. A committee has been formed to commemorate the centenary of his early experiments in 1788 and 1789, from which period the history of steam navigation undoubtedly dates.

IT is difficult to harden thin steel plates without causing them to become warped in the process. A correspondent of the *American Machinist* gives the following method as one which "he has used for many years with universal success":—Provide two pieces of iron, about 6 in. by 6 in. by 1 in., with one surface on each block planed, and spread a liberal supply of good sperm oil on each planed surface. Immerse the plates to be hardened in molten lead as far as they are required to be hardened. When a red heat is obtained, drop the piece quickly upon the cold surface of one of the iron blocks, and simultaneously lay the other block upon the work. When cool it will be found true. The blocks should be kept cool and also level to ensure an even thickness of oil.

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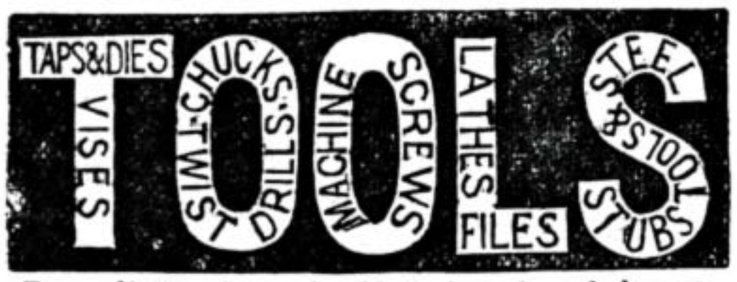

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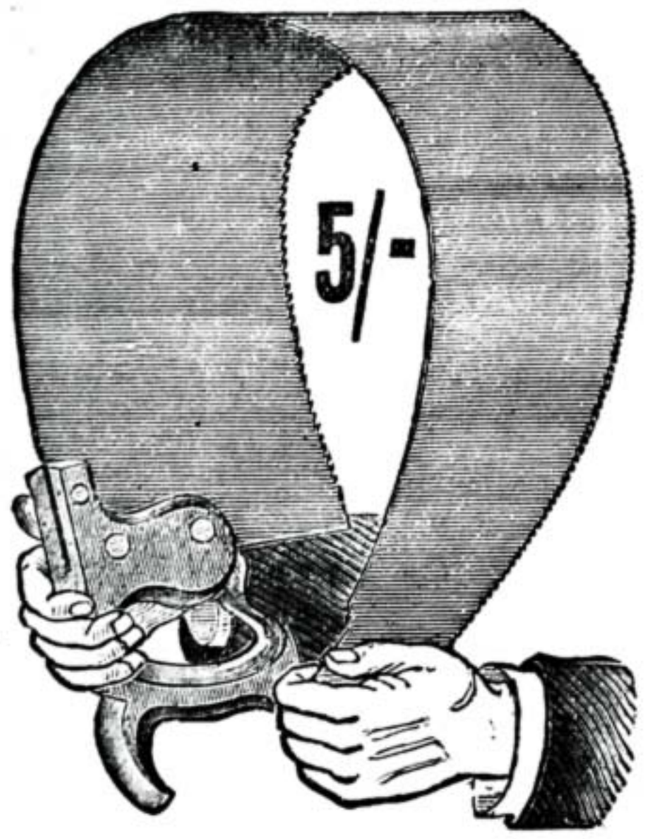

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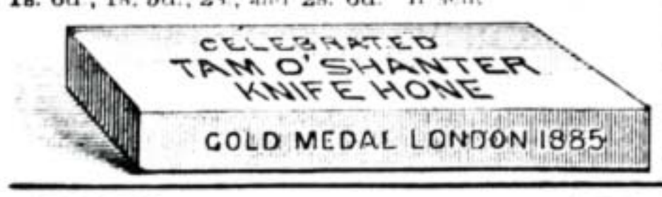

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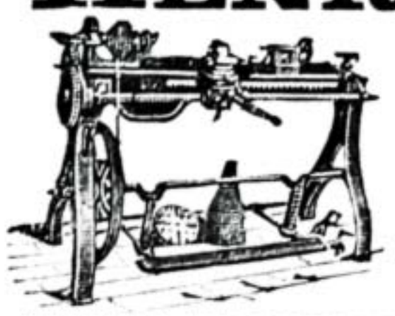

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